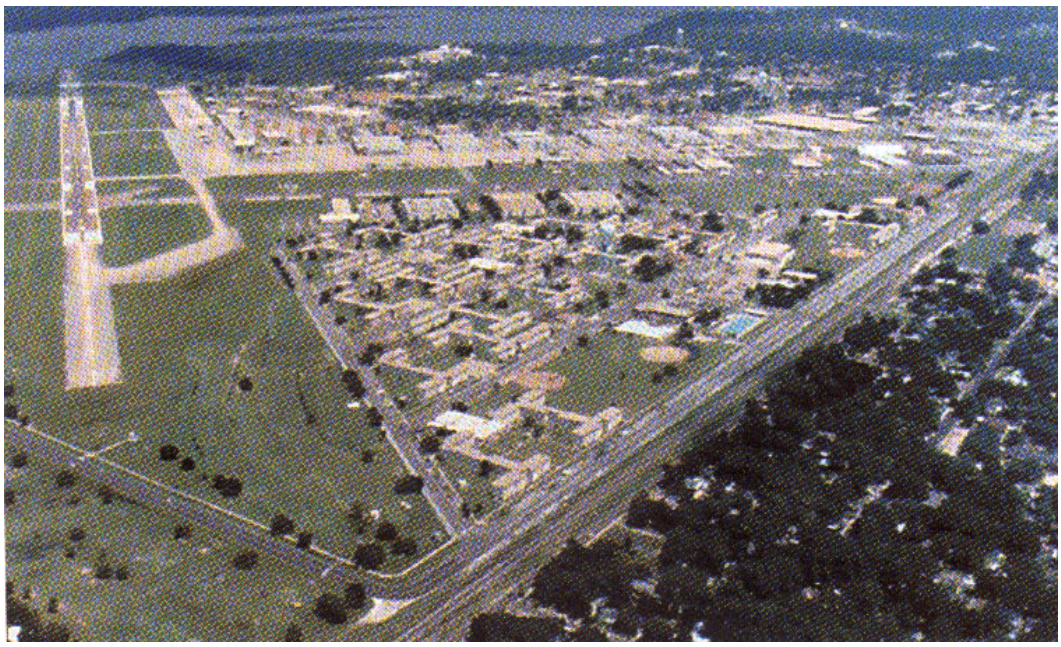
KEESLER AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR
ENVIRONMENTAL ASSESSMENT



Prepared by:

Electronics Systems Center

Hanscom AFB, Massachusetts

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EXECUTIVE SUMMARY

This environmental assessment (EA) has been completed as part of the National Environmental Policy Act (NEPA) process, in compliance with U.S. Air Force (USAF) instruction AFI 32-7061. According to this instruction, the EA provides analysis sufficient to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) and to aid federal agencies in complying with NEPA when no EIS is required.

This EA describes the proposed project to install two Digital Airport Surveillance Radar (DASR) systems at Keesler Air Force Base (AFB) in Mississippi for the purpose of training military personnel on the operation and maintenance of this radar system. This proposed action is part of the Department of Defense (DoD) National Airspace System (NAS) Program, which involves installation of new air traffic control equipment on U.S. Army, U.S. Navy, and USAF bases throughout the country. DoD NAS is a component of the aviation system capital investment plan developed by the Federal Aviation Administration (FAA) to modernize approach control systems in the United States and its territories.

The NAS program will comprehensively upgrade air traffic control systems infrastructure by systematically replacing analog systems with state-of-the-art, digital technology. The purpose of the DASR component of the NAS program is to detect and process aircraft position and weather conditions at airfields. The DASR system will use the ASR-11 radar to accurately locate aircraft, in terms of range, azimuth, and altitude; provide information regarding aircraft identification code; identify emergency conditions; and report six discreet weather precipitation levels. The ASR-11 at Keesler AFB is needed to expand the training capabilities and prepare military personnel for deployment to other stations where the ASR-11 will be placed. The existing training AN/GPN-20 systems at Keesler AFB will remain integrated in the training curriculum for a period of approximately ten years.

The DASR facilities at Keesler AFB would consist of: primary and secondary radar electronics, rotating antenna, 57-foot tower, utility cabling, power conditioning, electronic equipment grounding systems, foundations for the ASR-11 antenna tower, equipment shelter, fencing, and security systems. Facility construction would be within an approximately 0.07 acre site (47 feet by 61 feet), including a concrete pad foundation for an equipment shelter and antenna, and miscellaneous site improvements (minor re-grading and installation of geotextile fabric beneath six inches of crushed stone) (USAF, 2000a). Once the first DASR system is operational,

instructional classes will begin using the new system as an addition to the existing curriculum. Approximately 18 months after the first system is operational, a second system will be installed and training classes will use both systems on a regular basis to train military personnel.

Six areas were initially identified and evaluated as potential ASR-11 sites. A seventh site was added during an on-site meeting in January 2000. Three sites were eliminated from further consideration primarily due to conflicts with construction and/or environmental criteria. The four remaining alternative sites on Keesler AFB have been identified as potential locations for the ASR-11, based on operational, construction, and environmental siting criteria contained in the *National Airspace System Digital Airport Surveillance Radar Siting Plan* and the *Keesler AFB Final Site Survey Report*. The four remaining sites (2, 3, 4, and 7) were evaluated in this EA.

All alternative sites are located on Keesler AFB in close proximity to training classrooms within the Technical Training Complex. Site 2 is located on the tarmac immediately south of the southernmost corner of Hangar 3 in the Technical Training Complex. Site 3 is located between the eastern side of Building 4253 and Phantom Street. Site 4 is located west of a vehicle wash rack and east of Phantom Street. Site 7 is located southeast of Dolan Hall immediately west of a cooling facility building.

No significant environmental impacts are anticipated at any of the sites during construction or operation of the ASR-11; however, there would be some site modifications that may require mitigation. No subsurface contamination is expected to be encountered at any of the alternative site locations, although there is a possibility that fuel or fuel vapor may be encountered at Site 3 and Site 4. In the event that any contaminated soil or groundwater is encountered, proper base procedures would be followed. Construction at Site 7 may require the relocation of a sewer line that passes beneath the site. The exact depth of this pipe is unknown and would have to be determined during design if this site were selected.

Site 2 is situated entirely on existing pavement, which would be removed during construction. Installation of the ASR-11 facility at Sites 3 or 4 would result in the permanent clearing of maintained lawn within the approximately 47-foot by 61-foot area. Site 7 would require the clearing of a small section of grass, however a majority of the proposed site consists of concrete that would be removed during construction.

Issues that must be addressed during construction at any of the sites are elevated noise levels, increased dust, traffic and access disruption, aesthetic effects, site stability, and groundwater and storm water management issues. Potential impacts in these areas would be reduced using standard mitigation measures as outlined below:

- During the construction period, sheeting or supports of some kind may be used in the areas excavated for the tower footings and utility trenches in order to prevent collapse of these excavated areas.
- Groundwater levels would be monitored and maintained as necessary.
- To minimize noise impacts during construction, mufflers would be used on construction equipment and vehicles. Noise barriers may also be used to reduce noise levels. These barriers would have the benefit of providing a visual buffer.
- All equipment and vehicles used during construction would be maintained in good operating condition so that emissions are minimized, thus reducing the potential for air quality impacts.
- Dust will be controlled on-site by using water to wet down disturbed areas.
- All areas disturbed for the DASR system construction would be seeded with a grass mixture or covered with a geotextile fabric and crushed stone to stabilize the disturbed soils, in order to minimize the potential for erosion and sedimentation. Keesler AFB may also repave any areas that were originally paved.
- All hazardous materials used during construction of the ASR-11 would be handled and disposed of in accordance with Keesler AFB policies and protocols and all applicable state and federal regulations.
- Traffic management measures will be developed to facilitate traffic flow and pedestrian access.

Potential future impacts associated with operation of the ASR-11 facility would be minimized through use of mitigation measures including the following:

- All hazardous materials used during operation of the ASR-11 would be handled and disposed of in accordance with Keesler AFB policies and protocols and all applicable state and federal regulations.
- Due to the potential for RFR hazards during operation, warning signs, indicating the safe distance from the operating radar, would be installed at the facility perimeter.

All four sites are acceptable from an environmental perspective. Table ES-1 provides a summary of the potential environmental impacts associated with each of the alternative sites. Two ASR-11 systems are proposed for installation at Keesler AFB. The Air Force has selected Sites 3 and 4 as the preferred ASR-11 locations; however, this EA identifies potential impacts associated with placing an ASR-11 at each of the alternative sites.

Table ES-1. Environmental Impact Summary Matrix for the Alternative ASR-11 Sites at Keesler AFB

Category	No Action Alternative	Future Removal of Existing AN/GPN-20 Systems	Installation of the ASR-11 at Site 2	Installation of the ASR-11 at Site 3	Installation of the ASR-11 at Site 4	Installation of the ASR-11 at Site 7
Land Use	No Impact	Land currently occupied by the AN/GPN-20s could be reclaimed by Keesler AFB.	The installation and the operation and maintenance of the ASR-11 radar systems at any of the four alternative sites would be considered generally compatible with the surrounding land uses. The placement of the ASR-11 at any of the alternative sites would be an integral component of the adjacent training facility land use.			
Socioeconomics	No Impact	Installation of the ASR-11s and the dismantling of the AN/GPN-20s are both expected to have short-term minor contributions to the local economy; no adverse long-term impacts are expected. However, a positive long-term impact would include enhancing the capabilities of the base as a training facility in the future.				
Utilities and Transportation	No Impact	No impacts to utilities are anticipated. Minor Short-term impacts are possible to on-base traffic during dismantling.	A minimal disruption of the electrical system may be expected during ASR-11 installation. Minor short-term impacts to on-base traffic are possible during ASR-11 installation. The potential for impacts are expected to be greater as the distance from existing utilities increases. In general, however, all four alternative sites are close to existing utilities and the required lengths of new utility connections are minimal.			
			Lengths of new utility connections: 60 feet for electric, 80 feet for telephone and, 80 feet for fiber optic	Lengths of new utility connections: 90 feet for electric, 250 feet for telephone, and 200 feet for fiber optic	Lengths of new utility connections: 650 feet for electric, telephone adjacent to site, and 520 feet for fiber optic	Lengths of new utility connections: 50 feet for electric, 140 feet for telephone and 30 feet for fiber optic; site may require the relocation of a sewer line which may cause a short-term disruption to sewer service
Noise	No Impact	Classrooms are located in close general proximity to all four alternative sites and the installation of the ASR-11s and dismantling of the AN/GPN-20s are both expected to result in short-term noise impacts due to construction activities. Operation of the ASR-11 system would not generate excessive or persistent levels of noise, therefore no long-term impacts are anticipated.				
Air Quality	No Impact	Short-term impacts from removal of existing AN/GPN-20s and installation of the ASR-11s are expected to consist of dust generation from construction activities and anticipated to be minimal.				
Geology and Soils	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Surface Water and Groundwater	No Impact	No surface water resources are located proximate to sites. Groundwater is anticipated to be encountered during excavation at all four alternative sites. Proper base procedures for dewatering and discharge of groundwater would be followed during construction activities.				
Biological Resources	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Aesthetic Resources	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Cultural Resources	No Impact	Based on cultural resource surveys for Keesler AFB, cultural resources are not likely to be present within the proposed project areas for the four alternative sites or the existing AN/GPN-20 facilities.				
Pollution Prevention and Hazardous Waste	Hazardous materials used during operation and maintenance of facilities would continue being handled in compliance with all applicable regulations and base policies, therefore no impacts are expected.	No Impact	No subsurface contamination is expected to be encountered at Site 2 or Site 7. There is a possibility that fuel or fuel vapor may be encountered at Site 3 and Site 4. In the event that any contaminated soil or groundwater is encountered, proper base procedures would be followed. Neither construction nor the operation and maintenance of the radar facilities is expected to result in the release of any hazardous substances.			
Electromagnetic Energy	Existing radar systems would continue operating in accordance with base protocol, and no impact is anticipated.	No Impact	No impacts expected – due to the potential for RFR hazards during operation, warning signs, indicating the safe distance from the operating radar, would be installed at the facility perimeter.			

1.0 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The National Environmental Policy Act (NEPA; 42 U.S.C. Sections 4321-4347) is the basic national charter for protection of the environment (CEQ, 1978). NEPA establishes policy, sets goals, and provides the process for carrying out the policy and achieving the goals. NEPA procedures were established to ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. To implement NEPA, the U.S. Air Force (USAF) has issued internal instruction AFI 32-7061 (USAF, 1999a) that contains policies, responsibilities, and procedures dictating how NEPA should be implemented for USAF projects.

This environmental assessment (EA) has been prepared in compliance with AFI 32-7061. According to this instruction, the environmental assessment is a written analysis which serves to (1) provide analysis sufficient to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI); and (2) aid federal agencies in complying with NEPA when no EIS is required. If this EA were to determine that the proposed project would significantly degrade the environment, significantly threaten public health or safety, or generate significant public controversy, then an EIS would be completed. An EIS involves a comprehensive assessment of project impacts and alternatives and a high degree of public input. Alternatively, if this EA results in a FONSI, then the action would not be the subject of an EIS. The EA is not intended to be a scientific document. The level and extent of detail and analysis in the EA is commensurate with the importance of the environmental issues involved and with the information needs of both the decision-makers and the general public.

The proposed action addressed in this EA is the construction of two Digital Airport Surveillance Radars (DASRs; specifically, two ASR-11s) at Keesler Air Force Base (AFB) in Mississippi. This proposed action is part of the Department of Defense (DoD)

National Airspace System (NAS) Program, which involves installation of new air traffic control equipment on U.S. Army, U.S. Navy, and USAF bases throughout the country. These radars are also being installed at commercial airports under the authority of the Federal Aviation Administration (FAA). The implementation of the NAS program at DoD bases was previously evaluated in a programmatic EA and FONSI (USAF, 1995a), which fully detail the need for the program. The programmatic EA and FONSI are available on the internet at http://www.hanscom.af.mil/ESC-BP/pollprev/products.htm. Environmental review at FAA airfields is being conducted separately.

The programmatic EA for the NAS program committed to completing site-specific NEPA documentation tiered from the programmatic EA for individual NAS sites. This EA addresses the site-specific impacts of locating two ASR-11 systems, for training purposes only, on Keesler AFB, and evaluates the consequences of constructing and operating these ASR-11 systems on the natural and man-made environments.

1.2 PURPOSE OF THE ACTION

The NAS program was developed to modernize military air traffic control systems in the United States and its territories. DoD NAS is a component of the aviation system capital investment plan developed by the FAA. Pursuant to the Program Management Directive (USAF, 1994a), the DoD must provide services within its delegated airspace which are comparable to the services which FAA provides to civil aircraft in civilian airspace. These services include: flight following, separation, expeditious handling, radar approach control, and landing.

The purpose of the DASR component of the USAF NAS program is to detect and process aircraft position and weather conditions in the vicinity of USAF airfields. The DASR will serve to accurately locate aircraft, in terms of range, azimuth, and altitude; provide information regarding aircraft identification code; identify emergency conditions; and report six discrete weather precipitation levels. The purpose of installing the two ASR-11s at Keesler AFB is to expand the training capability and prepare military personnel for deployment to other stations where the ASR-11 will be installed. The new radar facilities

at Keesler AFB will not increase or decrease the current number of flights, change aircraft patterns, or otherwise alter existing base operations. The new radar facilities will diversify the existing training program to include the state-of-the-art facilities.

1.3 NEED FOR THE ACTION

The NAS program is comprehensively upgrading air traffic control systems infrastructure by systematically replacing analog systems with state-of-the-art digital technology. Keesler AFB is a training base where military personnel learn how to operate and maintain the radar systems. Personnel trained at Keesler AFB are then transferred to different military installations that already have the ASR-11 system installed. The two proposed ASR-11 radar systems at Keesler AFB will eventually replace two existing AN/GPN-20 airport surveillance radar systems, which were installed in 1981. Three AN/GPN-22 systems are also present on Keesler AFB.

The two new ASR-11 radar systems will be constructed separately. One of the two systems is scheduled to be installed in 2001-2002. The second ASR-11 radar system will be installed 18 months after the first, however both sites must be identified initially to avoid problems, such as interference with each other and the existing radar systems. The existing AN/GPN-20 radar systems will continue to operate for up to ten years after the completion of the new ASR-11 radar systems to provide training as long as the AN/GPN-20s are in the Air Force inventory. The ASR-11 has the capability to improve system reliability, provide additional weather data, reduce maintenance cost, improve performance, and provide digital data input to proposed new digital automation system air traffic controller displays. The proposed new ASR-11 radar systems will take advantage of the significantly increased capabilities of digital technology.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The proposed action is the installation of two ASR-11s at Keesler AFB in Mississippi (Figure 2-1) to enhance the training facilities on base. The existing AN/GPN-20 radar facilities are proposed to remain on-site and in use for up to ten years following the installation of the ASR-11s. The three existing AN/GPN-22s will also remain in operation as part of the training curriculum; therefore, a total of seven radar facilities will potentially be in operation simultaneously. The AN/GPN-22s have a fixed position aiming directly overhead (USAF, 2000b). Interference from the AN/GPN-22s with the proposed ASR-11 will be avoided by blanking out appropriate azimuths where the ASR-11 beam crosses the AN/GPN-22 beam. The primary function of the new ASR-11s will be to train military technicians on the operation and maintenance of similar Digital Airport Surveillance Radar (DASR) Systems being installed at various Department of Defense (DoD) facilities. Since various DoD facilities will maintain use of the AN/GPN-20 and AN/GPN-22, those systems will remain operational at Keesler AFB to continue training military technicians on the operation and maintenance of those systems. Alternatives to the proposed action include no action, or installation of the ASR-11s at two of the remaining alternative sites. The no-action alternative consists of **not** constructing the ASR-11 facilities and restricting the training program to the existing AN/GPN-20 and AN/GPN-22 systems.

The site survey selection process for this base was modified due to the unique requirements of this specific project. The ASR-11 systems on Keesler AFB will be used for training purposes only. Therefore, air space coverage requirements are modified (USAF, 2000a). In addition, the proposed action includes the installation of two ASR-11 facilities as opposed to a single facility. Four potential sites (Figure 2-2) were identified on Keesler AFB. This EA discusses and evaluates potential impacts associated with the placement of an ASR-11 at each of the four alternative sites and also summarizes the potential impacts associated with the no-action alternative. The Air Force has selected Site 3 and Site 4 as the preferred alternative sites based on operational, construction, and base considerations.

FIGURE 2-1.

KEESLER AFB LOCATION MAP

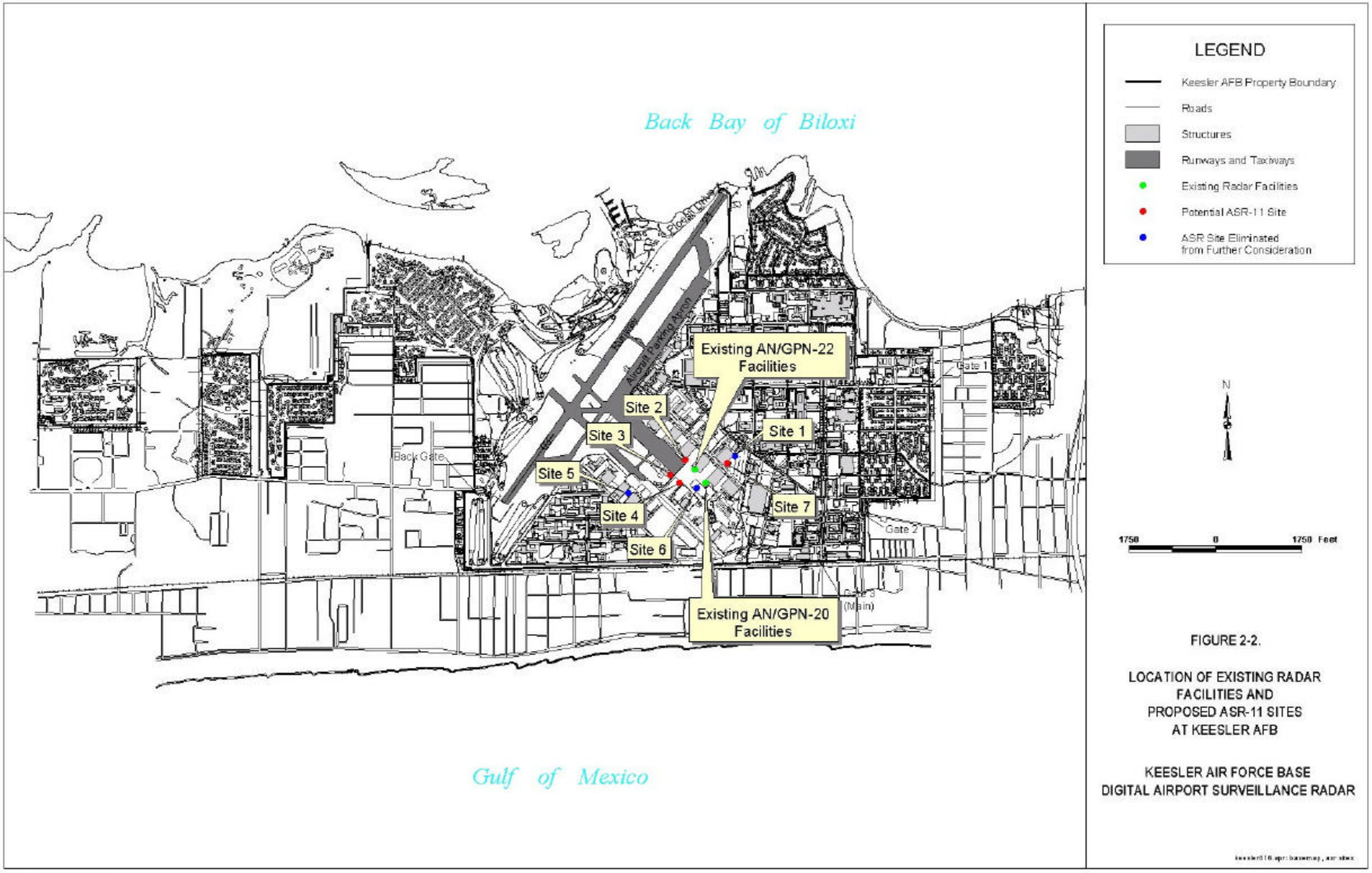


FIGURE 2-2.

LOCATION OF EXISTING RADAR FACILITIES AND PROPOSED ASR-11 SITES AT KEESLER AFB

KEESLER AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

Source: Keesler AFB

2.1 PROPOSED ACTION: DASR AT KEESLER AFB

2.1.1 DASR System

The DASR system would be used to train military radar technicians on the operation and maintenance of the ASR-11 system. The capabilities of the radar system will likely not be used for actual air traffic control. The system does have the capability to detect and process aircraft position and weather conditions at the airfield. The DASR system would consist of two subsystems: the Primary Surveillance Radar and the Monopulse Secondary Surveillance Radar. The purpose of the subsystems would be to accurately locate "targets of opportunity" for training military technicians on the operation and maintenance of the DASR system.

The Primary Surveillance Radar would transmit electromagnetic waves in the form of radio frequency pulses, which backscatter from the surface of aircraft, or other "targets of opportunity". The radar would measure the time required for an echo to return and the direction of the signal in order to determine the target's range and azimuth, respectively. By comparing variations in returned signal parameters, such as phase differences between pulses, the radar could separate moving targets from stationary clutter, such as mountains and trees. The primary radar would also report six discrete weather precipitation levels (from mild to hazardous) via a processing channel dedicated to weather detection and reporting.

The Monopulse Secondary Surveillance Radar (also called the beacon radar) would be a cooperative system consisting of ground-based beacon interrogator/receiver systems and existing aircraft based transponders. The secondary radar would obtain additional information, such as identification code, barometric altitude, and emergency conditions, from an aircraft transponder. Various processing techniques would be used to decipher both overlapping responses from multiple aircraft (synchronous garble) and aircraft responses to other beacon systems (asynchronous interference). The beacon radar would also provide rapid identification of aircraft in distress. The Monopulse Secondary

Surveillance Radar transmits at a frequency of 1030 MHz and receives at a frequency of 1090 MHz.

The DASR system would provide highly accurate target data to the Keesler AFB Technical Training Classrooms. The ASR-11s would have clutter rejection, target accuracy, and probability of detection that are equal to or better than the existing AN/GPN-20 facilities that will be phased out over a ten-year period at Keesler AFB. Operational characteristics of the new ASR-11 as compared to the existing AN/GPN-20 are shown in Table 2-1.

Figure 2-3. Typical ASR-11 Facility

The DASR facilities at Keesler AFB would consist of: primary and secondary radar electronics, rotating antenna, tower, interconnecting utility cabling, an uninterrupted power supply, power conditioning, and electronic equipment grounding systems. Facility construction, including separate concrete foundations for the ASR-11 antenna tower and equipment shelter, and miscellaneous site improvements (minor re-grading and installation of geotextile fabric beneath six inches of crushed stone), as well as fencing and security systems, will occur within variable acreage, based on site specific conditions (USAF, 2000a).

Table 2-1. Comparative Characteristics of Existing AN/GPN-20 and Proposed ASR-11 Primary Surveillance Radars

	Existing AN/GPN-20s	Proposed ASR-11
Frequency	2700-2900 MHz	2700-2900 MHz; 2 frequencies separated by at least 30 MHz
Power Peak	500 kW (magnetron)	19.5 kW (1 microsec) 18.0 kW (89 microsec)
Average	875 Watts	1600 Watts (Solid state)
Pulse Repetition Frequency	700-1200 pulses/second	720-1050 pulses/second

Sources: Belden, 1999; MITRE, 1997

Depending on the sites chosen for each DASR facility, approximately 60 to 650 feet of utility trenching between the edge of the site and existing duct banks/manholes would be required to connect the ASR-11 radar systems to existing electric lines (USAF, 2000a). The telephone connections and fiber optic connections may be made in a common utility conduit; however, the new telephone cable may connect to an existing cable at a different location within the utility conduit than the fiber optic connection. Between 30 and 520 feet of fiber optic cable, depending on the sites chosen, would be required to connect the ASR-11s to the training classrooms (Hangar No. 3).

Once the new DASR system is operational, the existing AN/GPN-20 and AN/GPN-22 systems would remain in service for continued training purposes until these systems are no longer used by the Air Force.

2.1.2 Alternative ASR-11 Sites

Four alternative sites on Keesler AFB have been identified as potential locations for the ASR-11, based on the siting criteria contained in the *National Airspace System Digital*

Airport Surveillance Radar Siting Plan (USAF, 1995a)(see Appendix B) and specific guidance for Keesler AFB given its function as a training facility. The four sites evaluated in this EA were identified based on operational, construction, and environmental criteria. Due to the unique situation of the placement of the DASR systems for training purposes only at Keesler AFB, the original siting criteria were modified slightly. Specifically, the following criteria were not applicable during the site selection process at Keesler AFB (USAF, 2000a):

- The site should not be located closer than 0.5 miles from the end of any existing or planned runway.
- The site should not be located closer than 0.5 miles from any point of required detection coverage.
- The site should not be located closer than 2,500 feet from any existing or planned electronic equipment installation or facility.
- The site should not be located less than 0.5 miles from National Weather Bureau radars and radiosonde equipment.
- The site should not be located closer than 1,500 feet to any above-ground object which would interfere or cause degradation in the ASR-11 operation.
- The site should accommodate underground cable routing from ASR-11 site to ATCT/RAPCON.

Alternative criteria were presented by the Air Force in considering possible locations for the ASR-11s at Keesler AFB. The following criteria were put forth by the Air Force in a memorandum dated 18 February, 2000 (USAF, 2000c) for use in identifying the final sites:

- The site should try to establish one permanent echo to establish a reference for the primary radar.
- The site should provide coverage of Gulfport to have enough live targets to establish track files, target trails, etc.

- The site should accommodate a tower height sufficient to avoid close-in screening from buildings and other obstructions and minimize interference with other radars in the training area.

- One MTI reflector can be located at the MSRM and one in the classroom.

- The engine generator set with fully equipped prefabricated housing is not required.

- The standard 140- by 140-foot site can be modified to a smaller site footprint if it is sufficient to the site the tower and equipment shelter, and allow safe access to all facilities during construction and operations.

Construction criteria included siting the ASR-11 in an area with a slope of less than 20 percent and away from railroads, highways, runways and taxiways, or power lines. The environmental criteria for siting included avoiding a number of sensitive resources, including: ecological/wildlife refuges, preserves, conservation areas and sanctuaries; wild and scenic rivers; prime and unique farmlands; historical, archaeological, and cultural sensitive sites; wetlands; threatened and endangered species habitat; designated hazardous waste sites; and floodplains. The details of the siting process are described in the Integrated Site Survey Report prepared by Raytheon Systems Company (USAF, 2000a)(see Appendix C).

Initial site selection screening criteria applied in January 2000 identified six sites (**Sites 1** through **6**, Figure 2-2) for consideration at the in-briefing, held January 12, 2000. A seventh site (**Site 7**, Figure 2-2) was identified by base personnel and the project team during a site walk subsequent to the in-briefing. **Site 1** is located immediately east of Dolan Hall in the north end of the adjacent parking lot. Due to a proposed project to create a new entrance to Dolan Hall, this site was deemed inappropriate for aesthetic reasons and because of potential conflicts with pedestrian traffic in the immediate area. **Site 5** is located between Jones Hall and Bryan Hall on the south side of Parade Lane. The installation of an ASR-11 in this location would have required special construction attention due to the lack of adequate space for the grounding grid and the tower footings. This site was eliminated from further discussion. **Site 6** is located approximately 100 feet south of the two existing AN/GPN-20 systems. Future construction in this area is

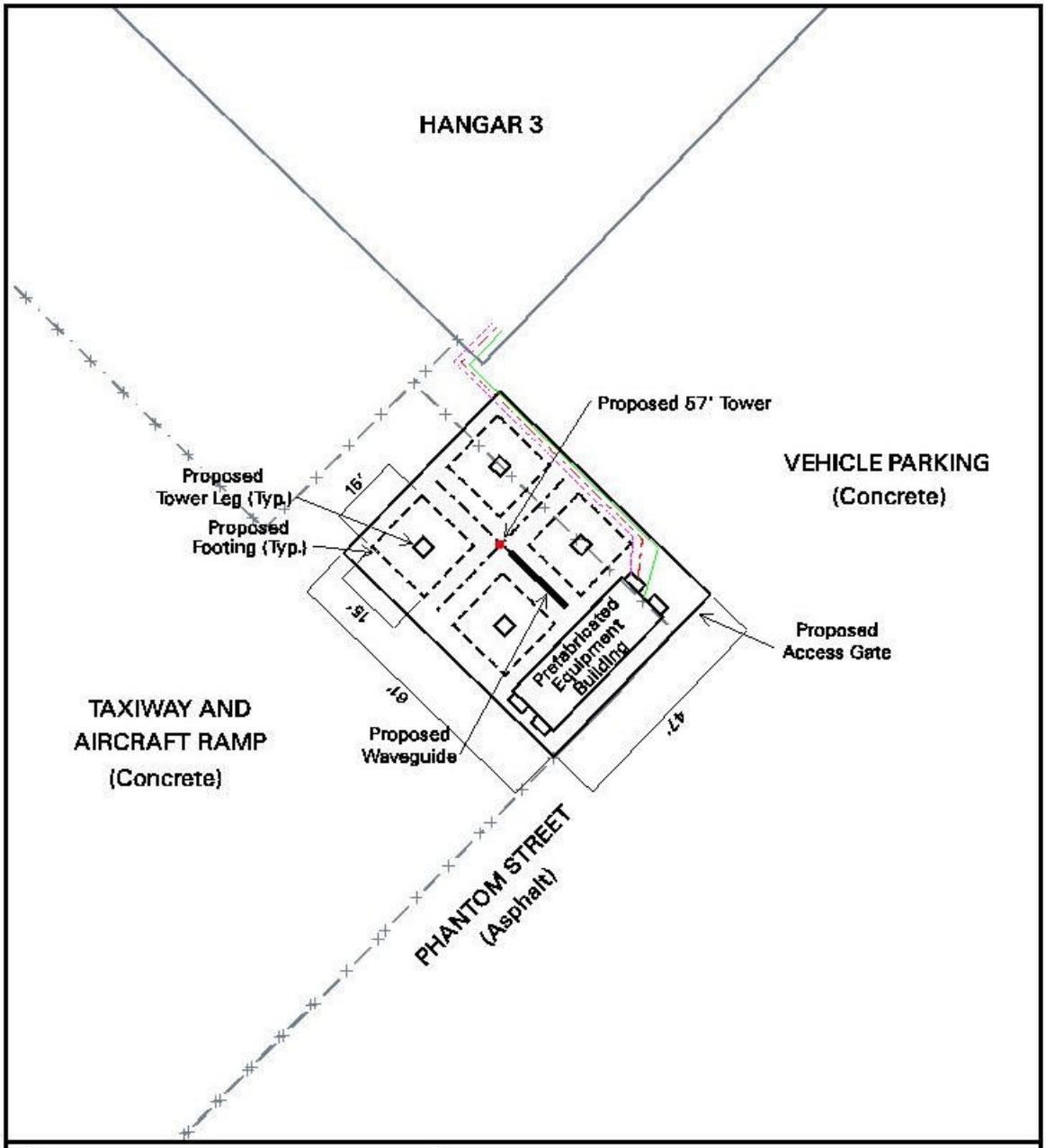
identified in the *Area Development Plan for the Tech Training Complex*; therefore, this site was eliminated from further discussion (USAF, 1999b).

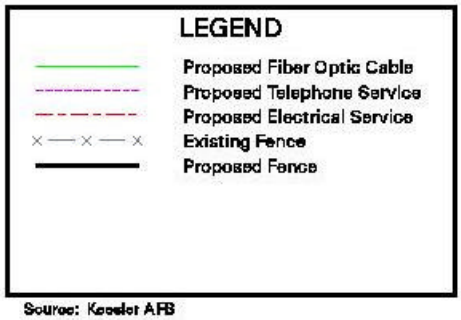
Four sites remained viable alternatives and are discussed in further detail in this document. **Site 2** is located on the tarmac of Hangar 3 immediately west of Cody Hall (Figure 2-4). This site provides convenient access to the 81st Technical Training Complex and classrooms. **Site 3** is located adjacent to the easternmost side of Building 4253 on the western side of Phantom Road (Figure 2-5). This site has excellent access to the Technical Training Classrooms and is accessible to utilities. **Site 4** is located approximately 250 feet southeast of Site 3 on the east side of Phantom Street and immediately west of a vehicle wash rack associated with the Transportation Squadron (Figure 2-6). This site has excellent access to utilities and the Technical Training Complex. **Site 7** is located between Dolan Hall and a cooling facility building immediately to the southeast of Dolan Hall (Figure 2-7). The area is a combination of grass and pavement, with utility services available.

2.2 NO ACTION ALTERNATIVE

Implementation of the No Action Alternative would result in the continued use of both the existing AN/GPN-20s and AN/GPN-22s. The Keesler AFB training program would be denied the opportunity to train military personnel on the ASR-11 radar system, which provides improved system reliability, additional weather data, reduced maintenance costs, and improved performance.

In this EA, conditions reflecting the No Action Alternative are discussed for each of the twelve main environmental parameters evaluated in Chapter Three. For each parameter, the No Action Alternative is characterized in the section addressing Future Baseline Without the Project.





Source: Keesler AFB

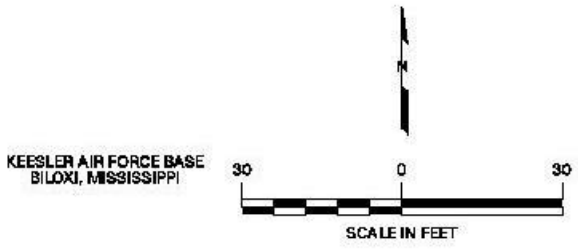


FIGURE 2-4. ALTERNATIVE ASR-11 SITE 2, KEESLER AFB

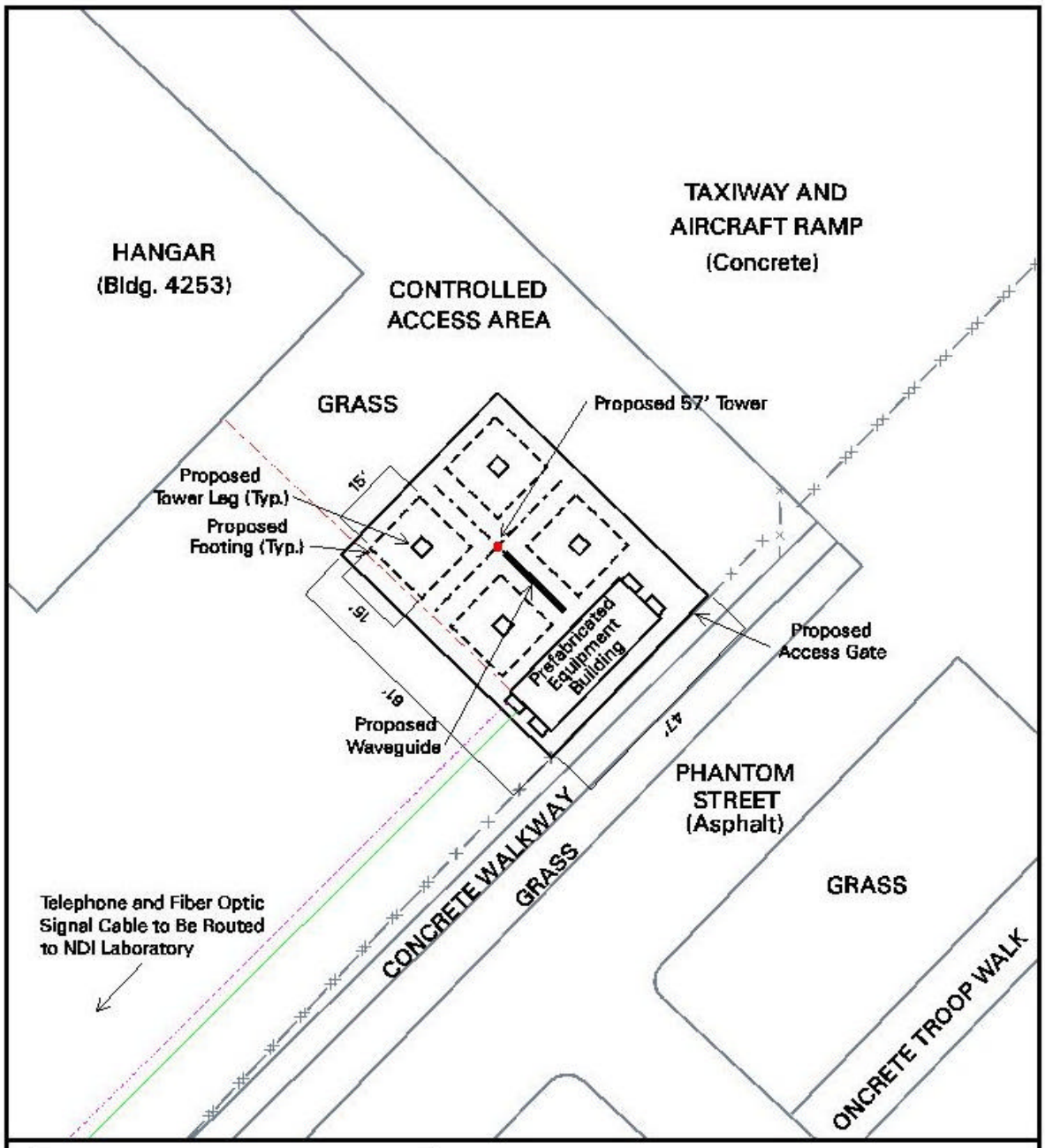


FIGURE 2-5. ALTERNATIVE ASR-11 SITE 3, KEESLER AFB

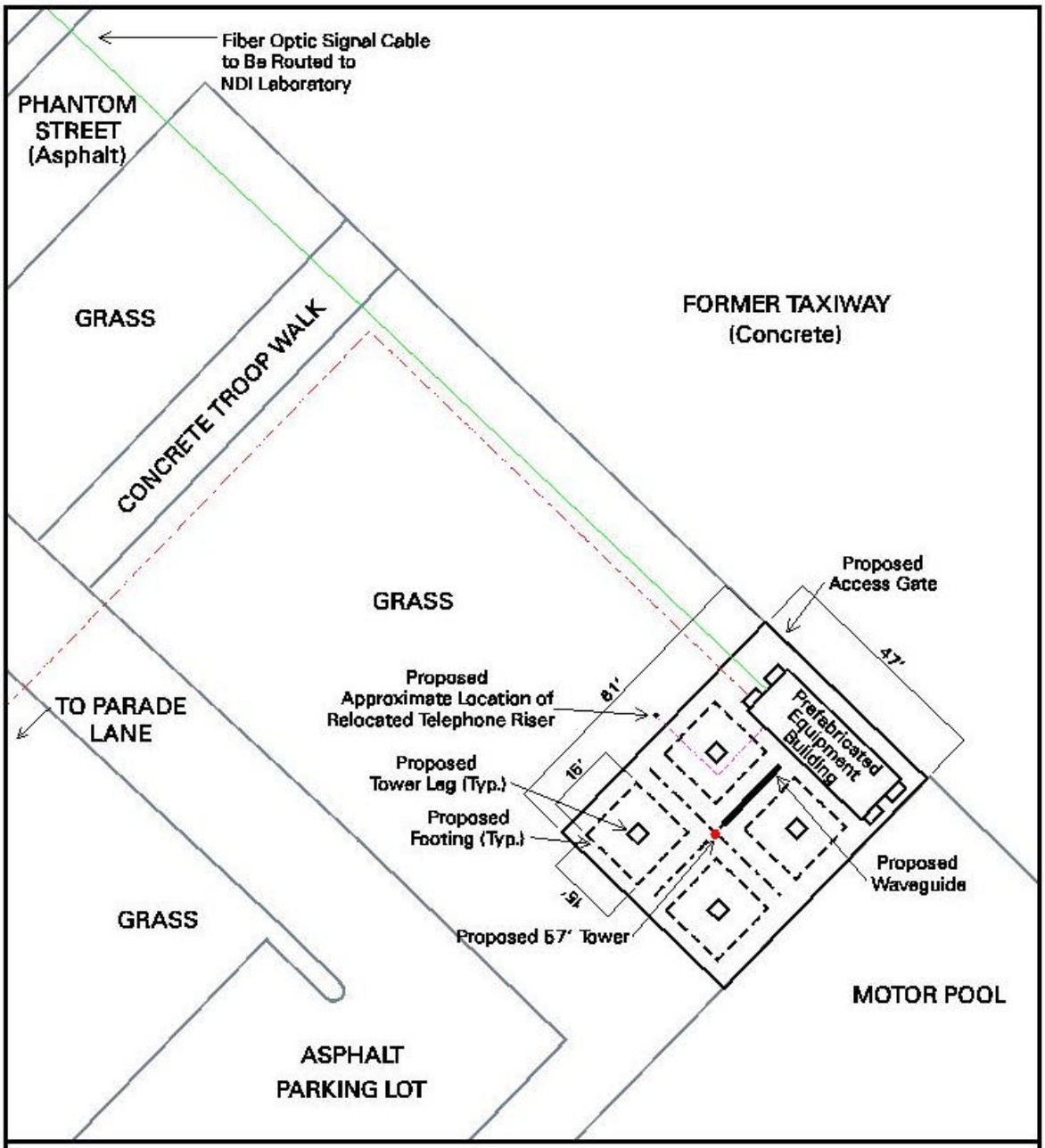


FIGURE 2-6. ALTERNATIVE ASR-11 SITE 4, KEESLER AFB

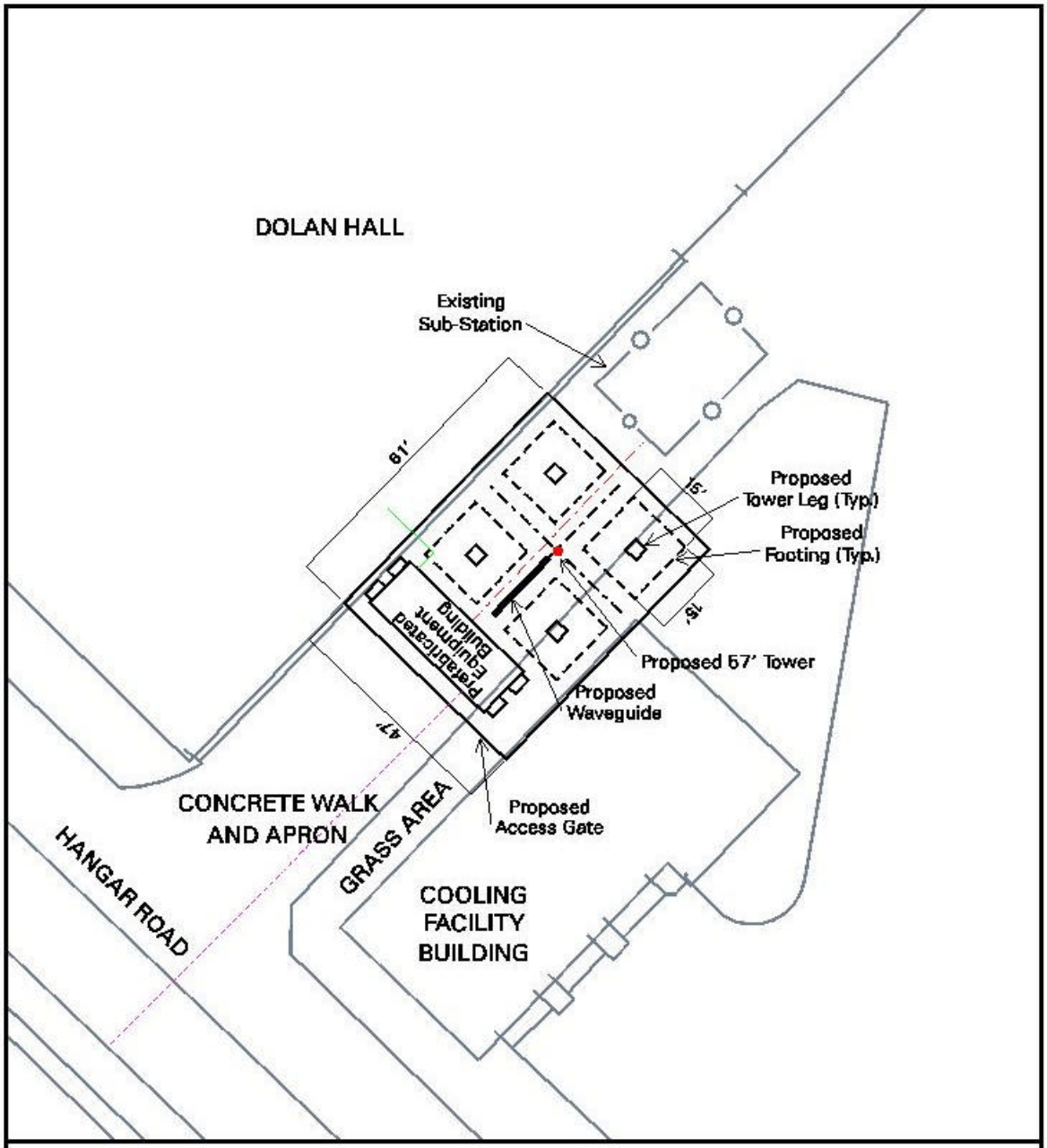


FIGURE 2-7. ALTERNATIVE ASR-11 SITE 7, KEESLER AFB

3.0 AFFECTED ENVIRONMENT

This section describes the existing environmental conditions and anticipated future conditions without the project in the vicinity of the alternative sites. The existing AN/GPN-20s will continue in operation for approximately 10 years once the new ASR-11s are installed, but will then be removed. The existing AN/GPN-22s will continue to operate once the ASR-11s are installed, and there is no plan for their removal. Discussion of the two AN/GPN-20s and the three AN/GPN-22s is presented when there is a direct effect or relationship with the areas under consideration for the proposed action.

3.1 LAND USE

The purpose of this section is to characterize land uses throughout Keesler AFB and in the vicinity of the base. This section addresses land use attributes of the alternative ASR-11 sites: Site 2, Site 3, Site 4, and Site 7.

3.1.1 Existing Conditions

Keesler AFB is located within the city limits of Biloxi, Mississippi (Harrison County), approximately 60 miles west of Mobile, Alabama and 90 miles east of New Orleans, Louisiana (Figure 2-1). Portions of the northern base boundary coincide with the Back Bay of Biloxi.

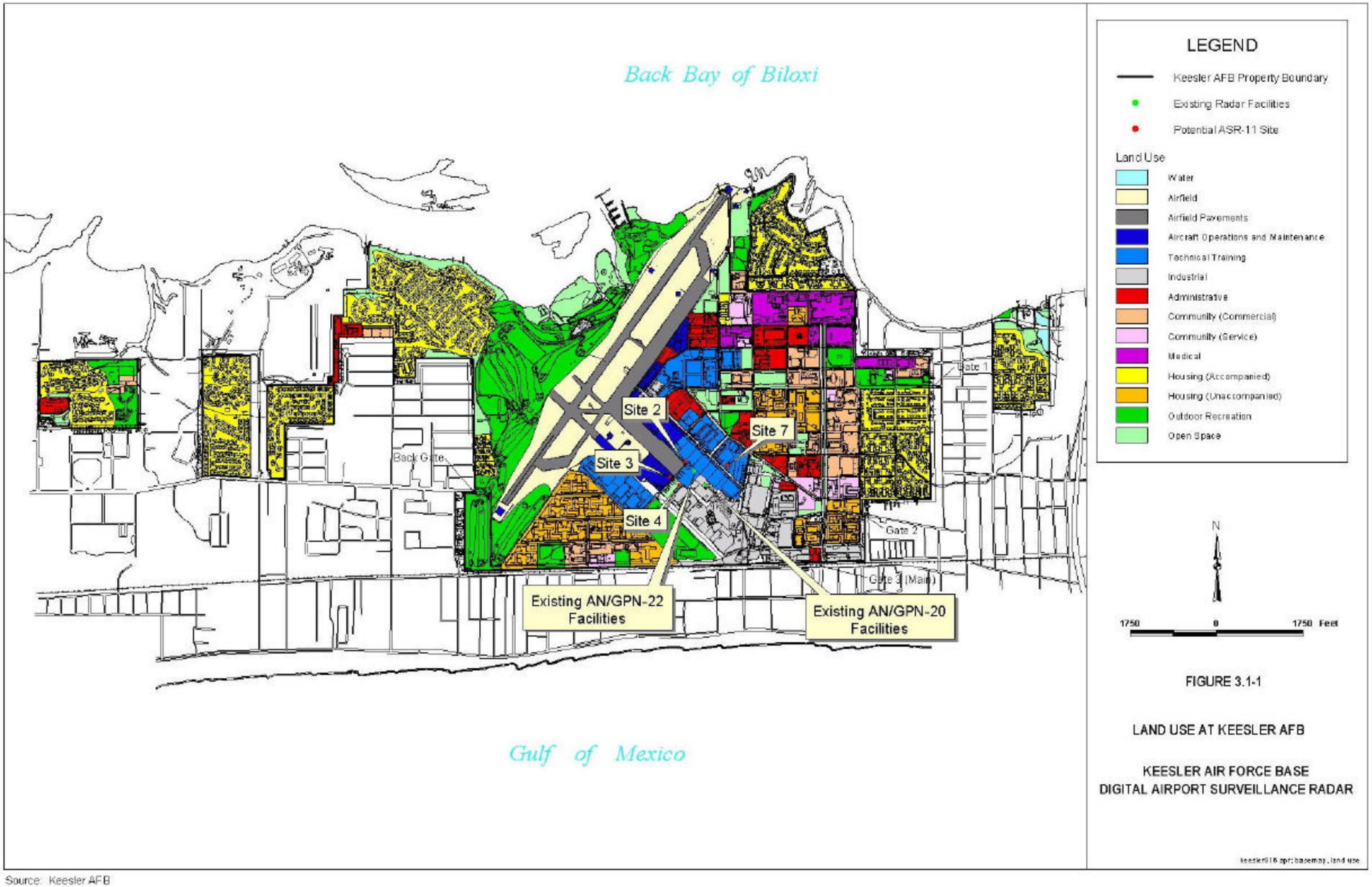
The City of Biloxi is the second largest city in Harrison County and the third largest city in Mississippi. The areas of Biloxi surrounding the base primarily consist of urban development. This urban development is composed of downtown area, strip commercial development, and large casinos and hotels along the major roads and intersections. Single and multi-family residential units are also located in the surrounding areas.

Keesler AFB occupies 3,554 acres. The base area consists of the main base (1,447 acres), East/West Falcon and Harrison Court Family Housing (164 acres), Thrower Park Family Housing (57 acres), and the Small Arms Range (1,886 acres). In addition, easements for runway clearance and gas lines account for an additional 113 acres (USAF, 1996a). Excluding the Small Arms Range, Keesler AFB acreage consists of approximately 42 percent mowed grounds, 33 percent grounds covered by facilities (buildings and pavement), 17 percent landscaped and semi-maintained areas, and seven percent un-maintained vegetated areas. The majority of the base is at an elevation of 20 feet above mean sea level (msl), with the maximum elevation occurring at the golf course and east of the airfield at 30 feet above msl (USAF, 1995b).

The existing radar facilities and the proposed ASR-11 sites are located within an area of the base known as the training area and an adjacent industrial area, where the training campus facilities are located (Figure 3.1-1). The training area and adjacent industrial area are situated in the south-central portion of the base. Located within the training area are three existing AN/GPN-22s, Thomson Hall, Hangar 1, Cody Hall (Hangar 2), a portion of a former taxiway, parking, and a military vehicles parking area. The two existing AN/GPN-20s are located within the adjacent industrial area.

Three main base roadways form the boundaries of the training area. These streets are Hangar Road to the northeast, Phantom Street to the northwest, and "Z" Street to the east (USAF, 1999b).

Site 2. Site 2 is located slightly west of Cody Hall between the southernmost corner of Hangar 3 and Phantom Street. Site 2 is located on the edge of an airfield pavement and technical training area of the base (Figure 3.1-1). The site is generally flat with slopes between zero and five percent. The immediate area contains a portion of concrete currently used for aircraft parking and movement. The only above-ground feature on the site is an approximately six-foot high perimeter fence. The "Controlled Access" perimeter fence bisects the site from a northwest to a southeast direction. Therefore,



Source: Keesler AFB

the site is located within two different land use classifications, namely, the "Technical Training" and "Airfield Pavement" areas. The site is devoid of all vegetation. Located outside the site but in the same general area are the five radar systems noted previously, and vehicular parking.

Site 3. Site 3 is located between Building 4253 and Phantom Street, approximately 375 feet southwest of alternative Site 2 within a controlled access area designated for Aircraft Operations and Maintenance. Site 3 is located near areas of airfield pavement, open space, and technical training (Figure 3.1-1). The site is a generally flat grassy area with slopes ranging from zero to five percent. Several small trees are located in the vicinity of Site 3, however none is located within the proposed alternative site itself. Located within the same general area are the five radar systems noted previously, and vehicular parking.

Site 4. Site 4 is located approximately 375 feet southwest of Hangar 2, southeast of Phantom Street, and immediately west of a vehicle wash rack. Site 4 is located within an area categorized as open space on the base land use map (Figure 3.1-1). This site is just to the west of the technical training area and north of an industrial area of the base. The site is also immediately adjacent to a parade area/troopwalk. Site 4 is generally flat with slopes ranging from zero to five percent. The site is covered with mowed grass and is devoid of trees. Located within the same general area are the five radar systems noted previously, and vehicular parking.

Site 7. Site 7 is located to the north of Hangar Road, 200 feet northwest of Thomson Hall. The site is situated on a mixed grass and paved area between Dolan Hall (Building 2916) and a cooling facility building (Building 2921). Site 7 is located within a designated technical training area (Figure 3.1-1). The site is flat with slopes of zero to five percent. There is no vegetation at this alternative site location. Located within the same general area are five radar systems noted previously, three occupied buildings, and vehicular parking.

Existing AN/GPN-20s and AN/GPN-22s. The two existing AN/GPN-20s are located less than 100 feet from each other in an industrial area of the base, immediately southwest of Hangar 1. The radar sites are entirely paved and generally flat. The area is adjacent to the technical training area of the base. The three AN/GPN-22 radar systems are located in the technical training area. These five radar systems are located in such close proximity to one another because they are an integral component of the adjacent Keesler AFB training facility where students must be able to easily access the radars during their instruction. Located within the same general area are vehicular parking and two occupied buildings. All four alternative ASR-11 sites are located less than 1000 feet from the existing radars.

3.1.2 Future Baseline Without Project

The 1996 Keesler AFB General Plan (USAF, 1996a) indicates that future plans for the base include increasing land used for technical training and medical land uses. Technical training will be expanded northeast onto open space, land occupied by World War II buildings, and the parade field. The parade field will be relocated within the Triangle where new dormitories will be constructed in a more consolidated manner than currently exists. Several streets will be closed and reconfigured to allow for more efficient use of the land and to alleviate traffic control problems. To the south of the training area, Tyler House and the existing running track will be converted to medical use.

Although new training facilities will be constructed where Thomson Hall, Hangar 1, and Hangar 2 currently stand in order to provide more suitable and modernized technical training and improved classrooms, no new construction is proposed to occur within the footprints of the alternative site locations (Figure 3.1-2). The existing AN/GPN-20s and AN/GPN-22s will be relocated within the training area.

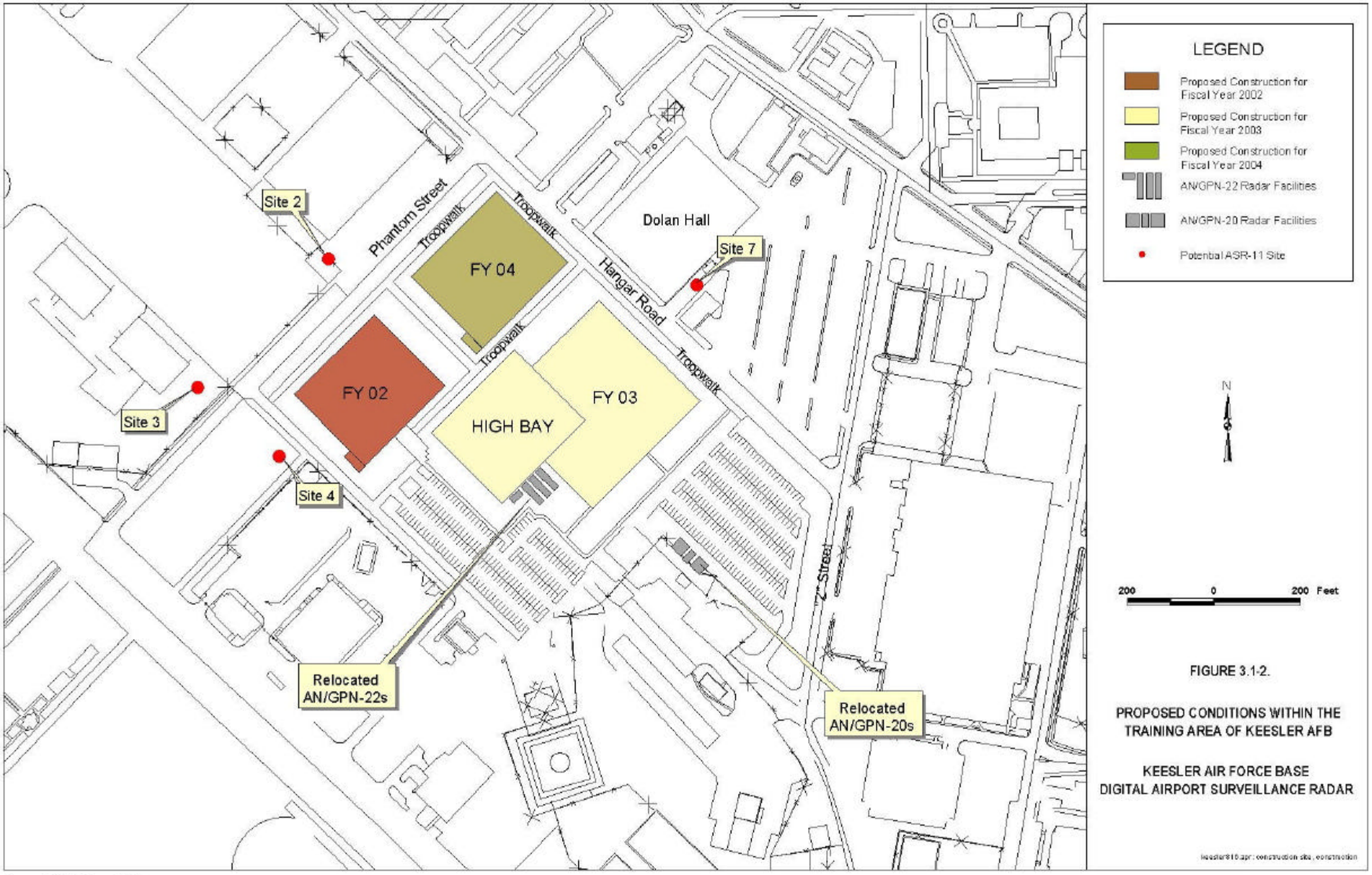


FIGURE 3.1-2.

PROPOSED CONDITIONS WITHIN THE TRAINING AREA OF KEESLER AFB

KEESLER AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

Source: US Air Force 1999b

3.2 SOCIOECONOMIC CONDITIONS

3.2.1 Existing Conditions

This section addresses the population, employment, general economic condition, and housing of the study area. Socioeconomic data specific to the alternative ASR-11 site locations do not exist. However, there are data for the general area of Keesler AFB, Harrison County, and the City of Biloxi.

3.2.1.1 Population. The populations of Mississippi and Harrison County have increased steadily over the past two decades (Table 3.2-1). Mississippi and Harrison County have experienced population growth of approximately nine and twelve percent, respectively, since 1980, with the greatest growth occurring over the last eight years. Biloxi experienced a decrease in population between the years of 1980 and 1990; however, 1998 population estimates indicate a slight population growth since 1990.

Table 3.2-1. Population Trends within Mississippi, Harrison County, and Biloxi

Area	1980 Census	1990 Census	% Change	1998 Estimate	% Change
Mississippi	2,520,770	2,573,216	2.1	2,751,335	6.9
Harrison County	157,665	165,365	4.9	177,194	7.2
Biloxi	49,311	46,319	-6.1	47,316	2.2

Sources: Gulf Regional Planning Commission, 1998; U.S. Bureau of the Census 1990 and 1999; University of Mississippi Center for Population Studies, 2000

The average assigned personnel at Keesler AFB total approximately 28,100 persons (USAF, 1996a) (Table 3.2-2). Half of this population consists of dependents and approximately 34 percent consist of military personnel. In addition, approximately 9,000 military retirees reside near Keesler AFB (USAF, 1996a).

Table 3.2-2. Keesler Air Force Base Population

Category	Number	Percent of Total
Military Personnel	9,500	33.8
Civilians	4,200	14.9
Dependents to Military Personnel	14,400	51.2
TOTAL	**28,100**	

Source: U.S. Air Force, 1996a

The main portion of Keesler AFB is located within Census Block Group 000900-9 (Figure 3.2-1) while nine other census blocks surround the main base area. For the purposes of this assessment, only the main base area and surrounding Census Block Groups are identified. The number of persons below poverty level of the populations within the nine surrounding block groups are generally lower than the City of Biloxi, Harrison County, and the State of Mississippi as shown in Table 3.2-3. The only exception is Census Block Group 001000-3, which has a higher number of persons below poverty level than the other block groups, Biloxi, the county, and the state. The minority populations within the nine block groups are also generally lower than Biloxi, the county, and state minority populations. There are two exceptions: Census Block Group 001000-3 with a minority population higher than Biloxi and the county, and Census Block Group 001300-1 with a minority population higher than Biloxi and equal to the county. The alternative sites are all located within Census Block Group 000900-9 and the closest Census Block Group to any of the alternative sites is 000600-3, which is approximately 1,600 feet from Site 4, 1,800 feet from Site 3, and greater than 2,000 feet from the other alternative sites.

3.2.1.2 Employment. As of June 2000, the civilian labor force totaled 1,299,400 in the state of Mississippi, 87,580 in Harrison County, and 19,740 in the City of Biloxi (Table 3.2-4). Unemployment rates for Mississippi, Harrison County, and Biloxi appear comparable as identified in Table 3.2-4. One-third of Biloxi's total labor force is employed through the U.S. Armed Forces (Biloxi, 2000; USAF, 1996a). Nearly one-fourth of Biloxi's civilian non-farming employment is connected with Keesler. Ingalls

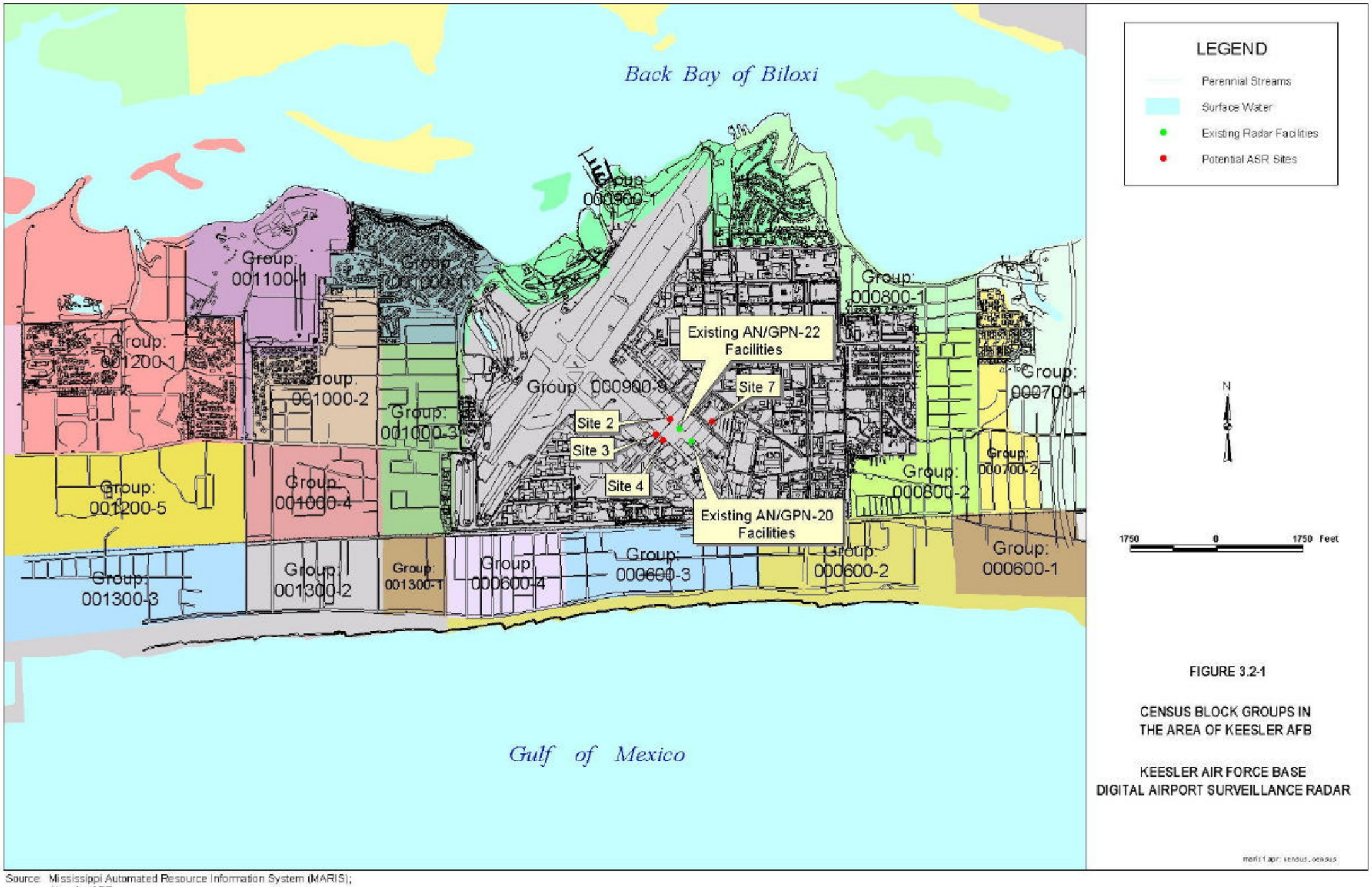


FIGURE 3.2-1

CENSUS BLOCK GROUPS IN
THE AREA OF KEESLER AFB

KEESLER AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

Source: Mississippi Automated Resource Information System (MARIS);
Keesler AFB

Table 3.2-3. Income and Ethnicity Statistics for Mississippi, Harrison County, Biloxi and Census Blocks for the Areas of Keesler Air Force Base.

	Mississippi	Harrison County	Biloxi	Census Block Groups									
				000600-2	000600-3	000600-4	000800-1	000800-2	000900-1	000900-9*	001000-1	001000-3	001300-1
Total Persons	2,573,216	165,365	46,319	523	651	723	698	1,544	720	5,218	1,933	1,050	724
Number of Households	911,374	59,557	16,644	258	385	346	273	719	207	445	586	407	350
Percent Below Poverty Level	25.2	19.0	21.4	14.6	9.6	5.5	3.5	17.0	0.0	8.4	2.1	37.2	11.7
ETHNICITY PERCENTAGES													
White	63.5	77.2	74.6	92.2	98.3	94.1	91.8	82.1	85.5	76.8	81.2	68.8	77.1
Black	35.6	19.5	18.6	4.2	1.1	3.5	6.4	13.6	12.1	17.5	15.0	28.5	19.6
American Indian	0.3	0.3	0.3	1.1	0.0	0.3	0.0	1.1	1.3	0.4	0.4	0.3	0.7
Asia/Pacific Islander	0.5	2.6	5.7	1.5	0.6	1.0	1.3	2.7	3.9	2.8	2.4	1.6	1.2
Other	0.1	0.4	0.7	1.0	0.0	1.2	0.4	0.6	0.3	2.6	1.0	0.9	1.4

Source: U.S. Bureau of the Census, 1990

* The main portion of Keesler AFB is contained entirely within this Census Block Group (000900-9). Some Keesler AFB housing areas are located in other block groups in the surrounding areas.

Shipbuilding is the largest employer in the Jackson-Harrison Area, with nearly 14,000 employees, and Keesler AFB is the second largest employer with over 12,000 people (USAF, 1995b).

Table 3.2-4. Labor Force, Employment, and Unemployment Data for Mississippi, Harrison County, and Biloxi for Month of June 2000

Area	Labor Force	Employed	Unemployed	Unemployment Rate (percent)
Mississippi	1,299,400	1,230,100	69,300	5.3
Harrison County	87,580	84,220	3,360	3.8
Biloxi	19,740	18,790	950	4.8

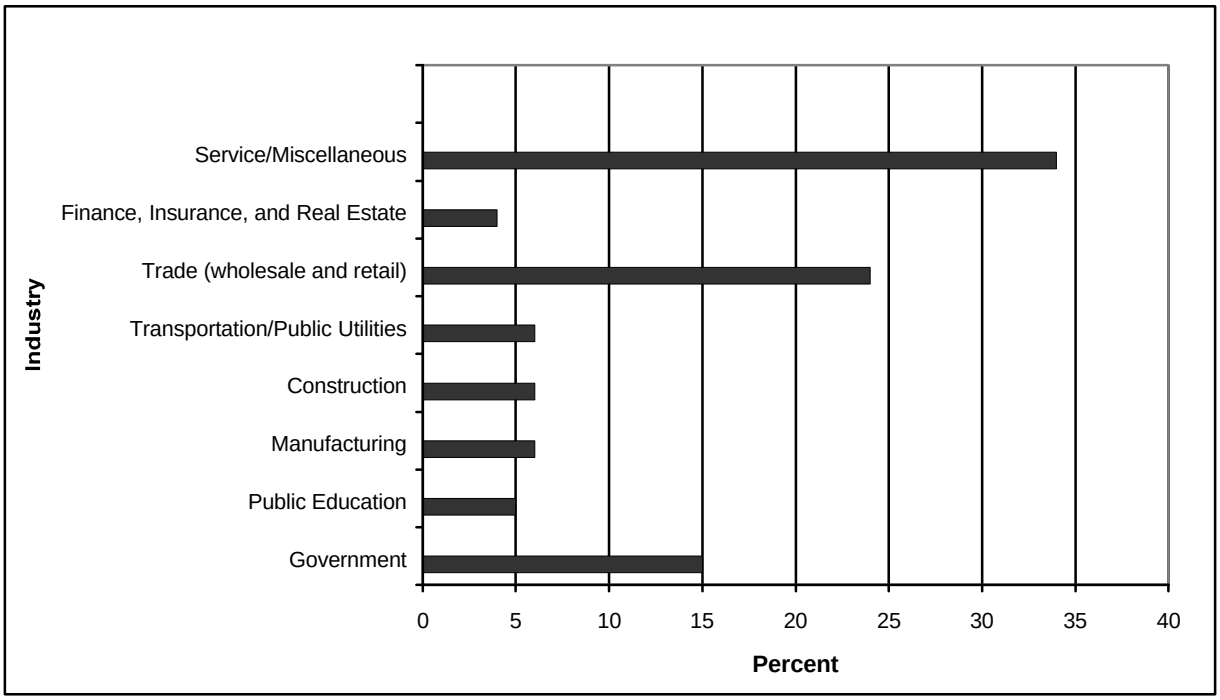
Source: Mississippi Employment Security Commission, 2000

The three largest employers by industry in Harrison County are service/miscellaneous, trade (wholesale and retail), and government (Figure 3.2-2). Seafood, government, and tourism/gaming are the three strongest sectors of Biloxi's economy. The tourism/gaming sector has experienced substantial growth since a county-wide referendum on dockside casino gambling was passed in 1992.

3.2.1.3 Expenditures of Keesler Air Force Base. Through direct employment and local purchases, Keesler AFB contributes significantly to the regional economy. The annual military payroll amounts to approximately $112 million and the civilian payroll is approximately $72 million. Keesler AFB also maintains contracts with local entities totaling approximately $65 million annually. The annual economic contribution of Keesler AFB to the surrounding area totals approximately $825,000,000 (USAF, 1996a).

3.2.1.4 Housing. In 1990 (the last year for which these data are available) the number of housing units in Harrison County was 67,813, representing nearly seven percent of the total housing units in the state of Mississippi (USBC, 1990) (Table 3.2-5). Harrison County had a housing occupancy rate of 88 percent and the state of Mississippi had an occupancy rate of 90 percent.

Figure 3.2-2. Employment by Industry for Harrison County



Source: Gulf Regional Planning Commission, 1998

Table 3.2-5. Housing Units and Vacancy Status in Mississippi and Harrison County in 1990

Area	Total Housing Units	Occupied			Vacant
		By Owner	By Renter	Percent Occupied	
Mississippi	1,010,423	651,587	259,787	90	99,049
Harrison County	67,813	36,572	22,985	88	8,256

Source: U.S. Bureau of the Census, 1990

Keesler AFB housing includes 1,036 buildings and 51 mobile home park spaces (USAF, 1995b). Unaccompanied housing on Keesler AFB consists of student housing located in the southwestern Triangle area (a student dormitory complex), permanent party housing located in the southeastern rectangle area, visitor housing centrally located on the base, and the Tyler House near the medical and administrative facilities. All students, except

the small percentage that are married, live in the Keesler dormitories. Family housing is located on the perimeter of the base. The on-base family housing occupancy rate is maintained at nearly 99 percent year-round (USAF, 1996a).

3.2.2 Future Baseline Without Project

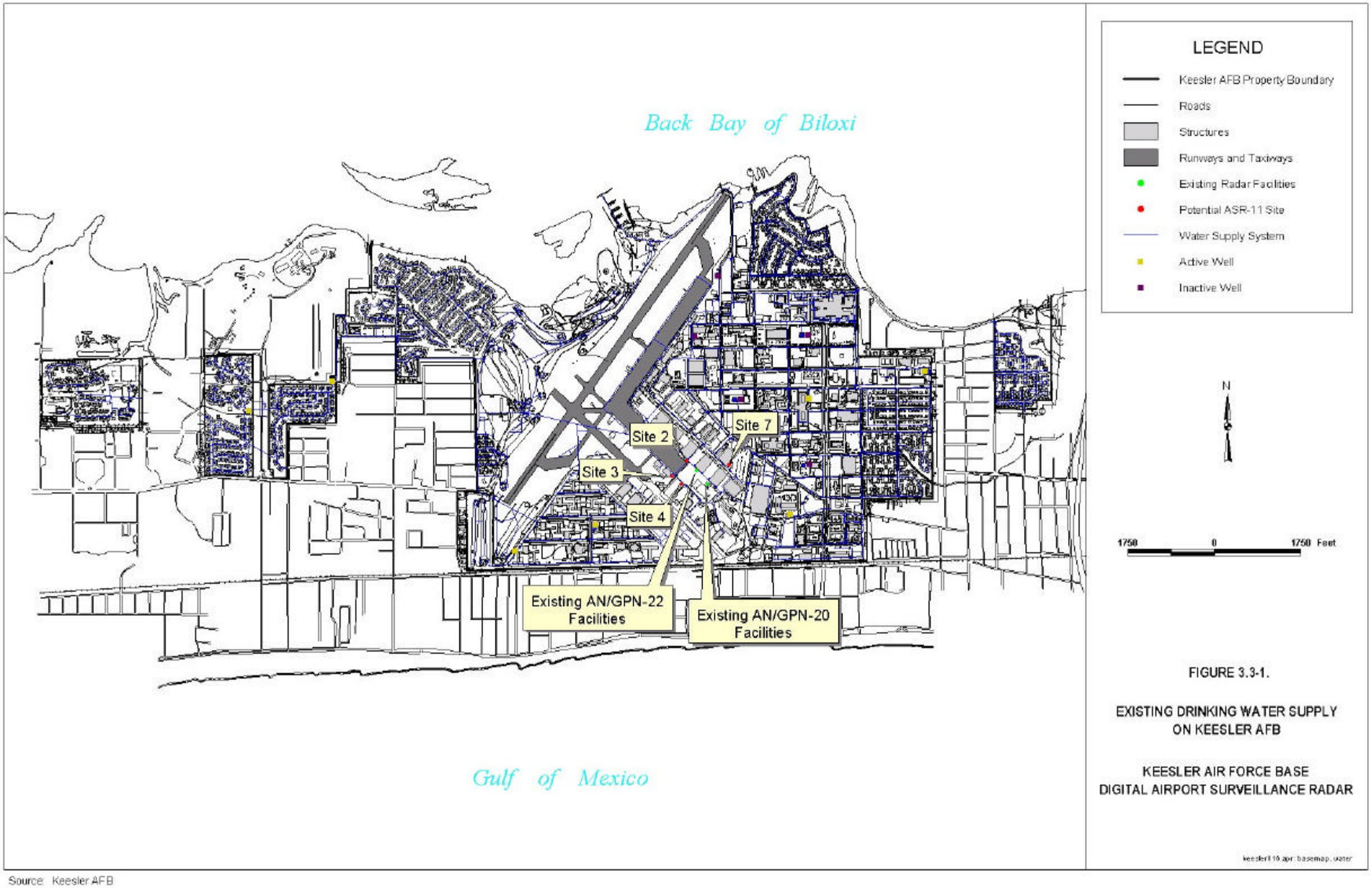
The socioeconomic characteristics of Harrison County and Biloxi are expected to follow current trends, with a majority of the employment resulting from the major industries indicated in Figure 3.2-2 and a continued increase in the tourism/gaming industry (GRPC, 1998). It is not expected that any substantial impacts to socioeconomic of the area would result from changes at Keesler AFB unless there is a major expansion or reduction in base operation. Plans of rebuilding and reconfiguring areas of Keesler AFB, including housing and training areas, may have a minor effect on socioeconomic conditions during construction due to increased employment and local materials contracts. The proposed on-base modifications call for an increase in available housing on Keesler AFB.

3.3 UTILITIES AND TRANSPORTATION

3.3.1 Existing Conditions

The utility service at Keesler AFB, including availability in the vicinity of the alternative ASR-11 sites, is discussed in this section. The utilities include water, wastewater, solid waste, electricity, telephone, fiber optics, and natural gas. Transportation is described in section 3.3.1.8.

3.3.1.1 Water Supply. There are twelve drinking water wells on Keesler AFB; however, currently only seven of these wells are active (Figure 3.3-1). These wells extend through 600 feet of sand into unconfined aquifers located in the miocene system, a geological formation that runs along most of the Mississippi coast. Each well can pump 500-1,000 gallons per minute (gpm), which satisfactorily supplies the approximately 3 million gallons per day used on average (USAF, 2000d and USAF, 1996a). The water is chlorinated and fluorinated at each well before distribution. Draw-down has been an



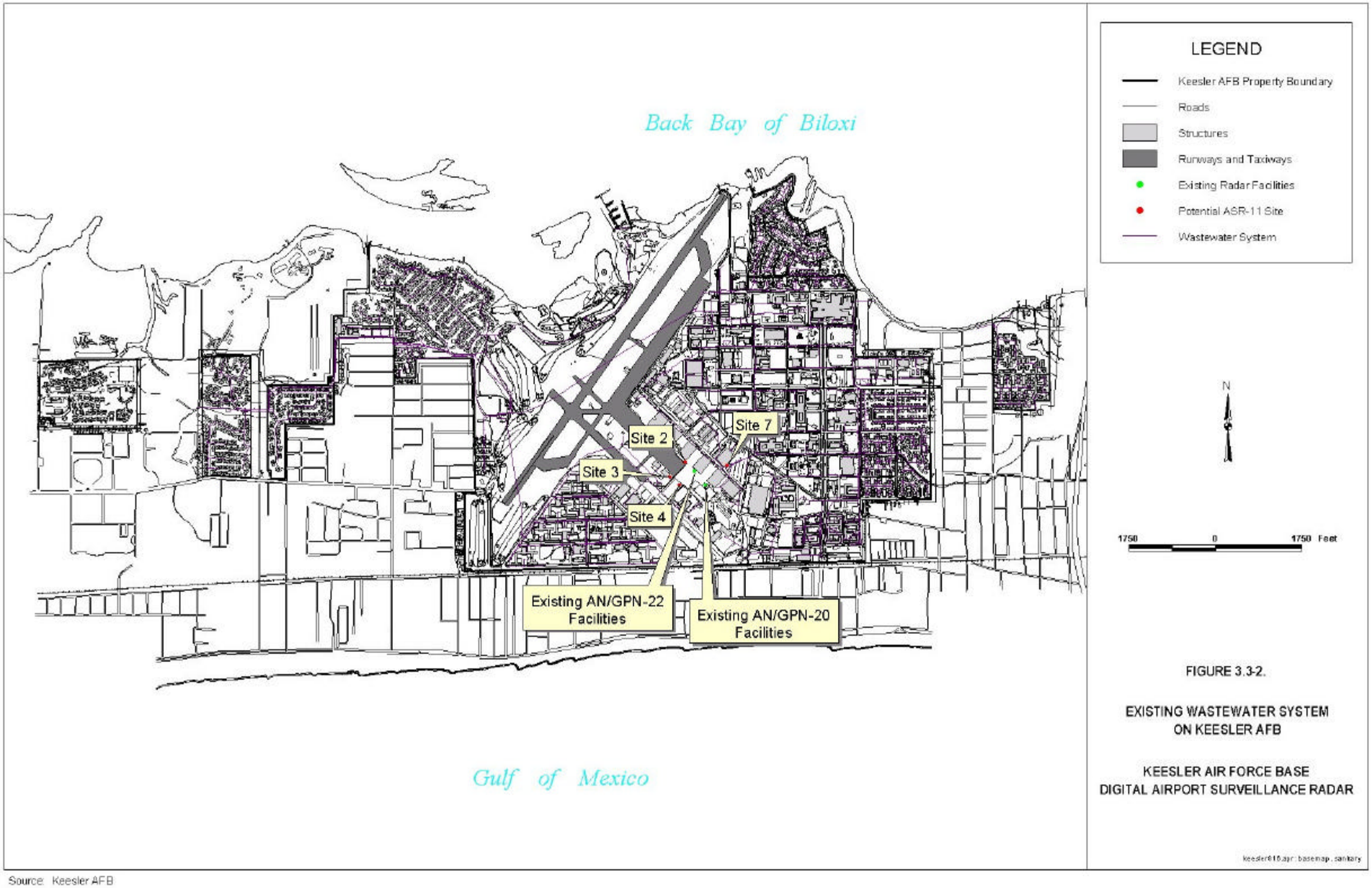
Source: Keesler AFB

issue over the past 30 years, resulting in extended well depths, but does not appear to threaten the water supply of the base (USAF, 1997a). Keesler AFB has the capacity to store 2.4 million gallons of water in six 400,000-gallon water towers. Over 99 miles of distribution piping, including cast iron, polyvinyl chloride (PVC), transite and steel traverse the base. (USAF, 2000j). Some of this piping has deteriorated since its installation during World War II. Currently, a study of the water system is being completed. While many of the housing areas have already been upgraded to PVC systems, new well and piping upgrades are planned (USAF, 2000d).

None of the four alternative ASR-11 sites is located in the vicinity of either a water well or a water tower. Water distribution lines are located within 150 feet of **Site 2**, **Site 3**, **Site 4**, and **Site 7**.

3.3.1.2 Wastewater. Keesler AFB has over 430,000 linear feet of sanitary sewer mains (Figure 3.3-2). The sewer lines on the base range in depth from approximately two feet to fifteen feet (USAF, 2000d). The system can accommodate a wastewater flow of approximately 3.24 mgd that is pumped to the West Biloxi Sewage Treatment Plant, located off-base (USAF, 1999c). Effluent from the treatment plant discharges into the Back Bay of Biloxi. The West Biloxi Sewage Treatment Plant is permitted to process 9.11 mgd during the months of June through October and 11.0 mgd for November through May, with an average discharge of 8.0 mgd. The housing area on the eastern side of the Keesler AFB installation discharges wastewater by gravity to the Keegan Bayou Plant. During Fiscal Year (FY) 1999, approximately 18,000 kGal (kilogallons) were discharged to Keegan Bayou Plant (USAF, 2000d).

Sites 2, 3, and **4** are located within 300 feet of a sanitary sewer line, while **Site 7** appears to be located immediately above an underground sewer line. The depth to the sewer line beneath Site 7 is unknown.



Source: Keesler AFB

3.3.1.3 Solid Waste. Municipal solid waste at Keesler AFB is managed in accordance with all applicable air force base guidelines. Construction and demolition waste from Keesler AFB is transported to the C.N. Williams Landfill, located in north Harrison County. This landfill is registered as a Class 1 landfill with a useful life of approximately 20 years (USAF, 1999c). A service contractor collects and disposes municipal solid waste from Keesler AFB in the Pecan Grove Landfill located in Pass Christian, Mississippi. Approximately 6,900 tons of municipal solid waste were transported off base during FY 1999. Facility 4004 contains the base recycling center. Aluminum, newspapers, plastics, paper bags/products, magazines, catalogs, cardboard, glass, tin, steel, metal and wooden pallets, among other items, are collected in this center and picked-up for processing by Browning Ferris, Inc.

3.3.1.4 Electricity. Keesler AFB receives electrical power from Mississippi Power Company via a single substation. Electrical power is distributed from the south end of the base at 22.86Y/13.2 kV, grounded. Power distribution is both overhead and underground. The majority of the system is owned and maintained by Keesler AFB (USAF, 1999b). Approximately 165,000,000 kW were used in FY 1999. A project to place all overhead power distribution underground is currently being undertaken by the base, to meet the long-term objective of all underground electrical lines. Due to the on-going nature of this project, no accurate map identifying which areas are underground and which are aboveground is available; however, the projected completion date of this project is FY 2001.

Currently, an existing utility line runs overhead at **Site 2**. Electrical service for **Site 3** will be extended from existing lines at Building 4253. **Site 4** electrical service will be extended from existing lines along Parade Lane. An underground grounding grid for Dolan Hall is located adjacent to alternative **Site 7**.

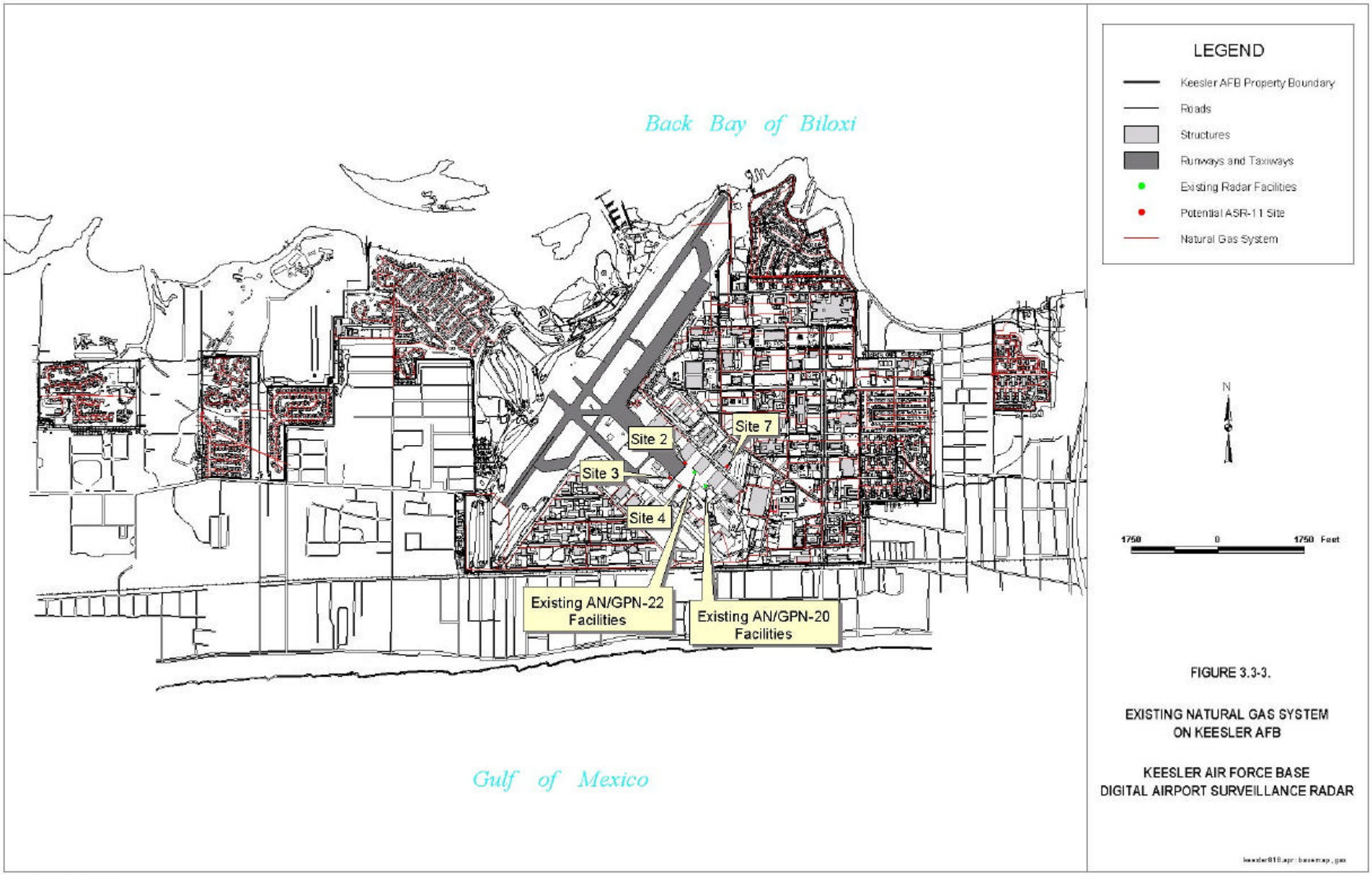
3.3.1.5 Telephone. The base is served by Bell South Telephone Company. Several long distance carriers are available. Most of the existing facilities are located in below ground conduits, providing dial-up telephone services to most of the buildings on base. The main telephone switch is located in Facility 2801.

Site 2 is located within 80 feet of telephone service connection at Hangar No. 3. **Site 3** is located approximately 250 feet from telephone service at the Non-Destructive Inspection (NDI) Laboratory building 4253. Above-ground telephone service is provided in the immediate vicinity of **Site 4**. Telephone service is provided along Hangar Road, within 140 feet of **Site 7**.

3.3.1.6 Fiber Optic Cable. Many of the structures on Keesler AFB are connected to the fiber optic system. Fiber optic cables are connected to Hangar 3, which is within 80, 200, and 520 feet of **Sites 2**, **3** and **4**, respectively. The 81st Training Wing classroom within Dolan Hall contains fiber optic cabling systems. **Site 7** is located adjacent to Dolan Hall.

3.3.1.7 Natural Gas. Natural gas is supplied to the base from United Gas Pipeline via ENTEX, Inc. The natural gas enters the base via a high pressure main approximately 14 miles long, carrying gas from Gulfport to the base. The pressure main enters the base in the vicinity of the golf course at the southwest corner of the base. Several pressure regulating stations control the distribution system, which consists of approximately 370,000 linear feet of gas mains throughout the base (Figure 3.3-3). Approximately 437,000 MCF of natural gas were used during FY 1999 (USAF, 2000d). The natural gas distribution system is primarily steel, with some polyethylene. Some pipelines are old, similar to the water distribution system, and the metallic pipelines are experiencing deterioration; however, no replacement program is planned at this time.

Sites 2, 3, 4 and **7** are located within 1,000 feet of the natural gas distribution system on base.



Source: Keesler AFB

3.3.1.8 Transportation. Several modes of transportation are available along the Mississippi Gulf Coast, including railway, interstate highway, commercial aviation, deepwater ports and inland navigable waters.

Interstate 10 is the major highway that runs east-west through Harrison County. Major roads that link Keesler AFB to this interstate include U.S. 90 and State Road 15, which is paralleled by I-10. State Roads 53 and 67 are also located in the vicinity of Keesler AFB. Major local roads within the vicinity of Keesler include Irish Hill Drive, which borders the south side of Keesler AFB; Pass Road, which terminates on the west perimeter of Keesler AFB; Porter Street; Division Street; and Howard Avenue. Greyhound and Trailways provide interstate bus service from the local area.

Three main gates allow access to Keesler AFB (Figure 2-2). Gate No. 1 is located on the eastern side of the base on Meadows Road. Gate No. 2 is located on Ploesti Drive, which serves as the primary road carrying traffic from areas west of the base. Larcher Boulevard, another primary road on the base, connects the main gate and the medical center.

None of the four alternative sites is located on a primary road leading to a gate. The closest roadway to **Site 2, Site 3** and **Site 4** is Phantom Road. Hangar Road is located immediately adjacent to **Site 7**.

3.3.2 Future Baseline Without the Project

No substantial changes in wastewater treatment, solid waste, natural gas, or transportation conditions are anticipated in the near future on Keesler AFB. A phased construction project, including demolition of old buildings, construction of new buildings, providing cover for specific areas and reconstruction of existing developed areas is currently being implemented on Keesler AFB. Construction will result in a short-term increase in demolition material requiring disposal. This construction may also temporarily disrupt transportation patterns, while at the same time may facilitate the effort to place electrical, telephone and fiber optic utilities underground.

3.4 NOISE

The existing general noise environment of Keesler AFB is discussed in this section, as well as the noise environments of the four alternative ASR-11 sites and the existing AN/GPN-20 locations. Many federal agencies use the day-night average sound level to describe noise and to predict community effects from long term exposure to noise. In addition, this noise level classification system is used to determine the appropriateness of a given use of specific land (land use compatibility) relative to the average level of environmental noise experienced at the location. These guidelines are described in the *Air Installation Compatible Use Zone (AICUZ) Program Handbook* (USAF, 1991). Noise levels below 65 decibels are considered to be compatible with residential land use. Residential land use is discouraged in areas with a noise level between 65-70 decibels, strongly discouraged in areas with sound levels between 70 and 75 decibels, and considered generally unacceptable for areas with noise levels exceeding 75 decibels.

3.4.1 Existing Conditions

The primary source of noise in the vicinity of Keesler AFB is a result of normal base operation and aircraft usage and maintenance. Noise generated independent of aircraft flight noise on Keesler AFB (maintenance and shop operations, ground traffic, construction, etc.) is comparable to the noise generated in the surrounding community; therefore, noise generated during aircraft flight operations represents the most substantial noise source on the base. The associated noise contours generally follow the shape of the runways with the area of highest decibels (75 and higher) in the immediate vicinity of the runways and extended areas of higher level noise following the aircraft approach and departure corridors. Approximately 381 acres and 485 off-base residences are located within an area receiving flight noise in the 65 to 70 decibel range and 326 acres are located within in area receiving noise in the 70 and higher decibel range, although no residences are located within these 326 acres (USAF, 1999c).

All four proposed alternative sites are located in close proximity to the training area of the base where there are students in classrooms. The training area and all four alternative sites are located in an area where measured noise levels average less than 65 decibels.

3.4.2 Future Baseline Without the Project

In the future without the project, it is anticipated that there would be a short-term increase in ambient noise conditions in the area of the four alternative ASR-11 sites resulting from proposed construction activities in the area. However, upon completion of the construction activities it is anticipated that noise levels would return to the former baseline conditions.

3.5 AIR QUALITY

Existing air quality characteristics in the vicinity of the four alternative ASR-11 sites are discussed in this section. Information regarding air quality was compiled from regional data and is expected to describe site characteristics.

The U.S. Environmental Protection Agency (EPA) defines ambient air in 40 CFR Part 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act and the 1977 and 1990 Clean Air Act Amendments, EPA has developed ambient air quality standards and regulations. The National Ambient Air Quality Standards (NAAQS) were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, EPA has issued NAAQS for six criteria pollutants (Table 3.5-1): carbon monoxide, sulfur dioxide (SO_2), ozone (O_3), nitrogen dioxide (NO_2), lead (Pb), and particulates (e.g., PM-10, particles with a diameter less than or equal to 10 micrometers (μm)).

The state of Mississippi monitors air quality and regulates sources to ensure compliance with air emission regulations pursuant to the Mississippi Air and Water Pollution Control Act, applicable regulations developed by the EPA, and the Federal Clean Air Act. Mississippi administers the Title V Air Operating Permit program, which originated in

the amendments to the Clean Air Act enacted in 1990. Each major source of air pollution is required to obtain a Title V Operating Permit, which sets all air requirements applicable to the source and specifies the methods by which the source must demonstrate compliance (MDEQ, 2000a). As stated in the Mississippi Administrative Code, Title 30, Chapter 101.21 as amended, the state of Mississippi has adopted the NAAQS as the Mississippi standards (Table 3.5-1).

3.5.1 Existing Conditions

The climate at Keesler AFB is classified as subtropical. The region experiences mild winters and warm, moist summers. Average temperatures range from 52 degrees in the winter to 83 degrees in the summer, and the average annual precipitation is 61 inches. October is typically the driest month and July the wettest. Winds are predominantly from the north during the autumn and winter, while during the spring and summer months winds are usually from the south. Average wind speed at Keesler AFB is 6 miles per hour and the maximum-recorded wind speed occurred during a hurricane at 130 miles per hour.

Keesler AFB is included in the Mississippi Title V Permit Program, and all base facilities are managed under this all-inclusive permit (MDEQ, 2000b). The Title V Permit consolidates all federal, state, and local air quality requirements into one permit. Air emission sources on the base include vehicles, aircraft, incinerators, boilers, painting operations, and degreasing operations (USAF, 1996a). As of July 31, 2000, Harrison County and the entire state of Mississippi are in attainment for all six major air pollutants listed in Table 3.5-1 (EPA, 2000b; MDEQ, 2000c).

Table 3.5-1. National and Mississippi[1] Ambient Air Quality Standards

Air Pollutant	Averaging Time	Primary NAAQS[7,8,9]	Secondary NAAQS[7,8,10]	Mississippi Standards[7,8]
Carbon Monoxide (CO)	1-hour[2] 8-hour[2]	35 ppm[5] 9 ppm	No Standard No Standard	35 ppm[5] 9 ppm
Nitrogen Dioxide (NO_2)	Annual[3]	0.053 ppm	0.053 ppm	0.053 ppm
Sulfur Dioxide (SO_2)	3-hour[2] 24-hour Annual	No Standard 0.14 ppm 0.03 ppm	0.050 ppm No Standard No Standard	No Standard 0.14 ppm 0.03 ppm
Particulates (PM-10)[6]	24-hour Annual	150 $\mu g/m^3$ 50 $\mu g/m^3$	150 $\mu g/m^3$ 50 $\mu g/m^3$	150 $\mu g/m^3$ 50 $\mu g/m^3$
Ozone (O_3)	1-hour[4]	0.12 ppm	0.12 ppm	0.12 ppm
Lead (Pb)	Quarterly Average[3]	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$

1 Mississippi has adopted NAAQS

2 Not to be exceeded more than once a year

3 Not to be exceeded

4 Not to be exceeded more than one day per year

5 ppm = parts per million by volume

6 Particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers

7 The 8-hour primary and secondary ambient air quality standards are met at a monitoring site when the average of the fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.08ppm.

8 The NAAQS and Mississippi standards are based on standard temperature and pressure of 25 degrees Celsius and 760 millimeters of mercury.

9 National Primary Standards: The levels of air quality necessary to protect the public health with an adequate margin of safety. Each state must attain the primary standards no later than three years after the state implementation plan is approved by the EPA .

10 National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the state implementation plan is approved by the EPA.

Sources: Environmental Protection Agency, 1998 and 2000a; Mississippi Commission on Environmental Quality, 1998; U.S. Air Force, 1999c

The 81st Training Wing has a plan for reducing air contaminant emissions during an air pollution alert, warning, or emergency, as defined in the Mississippi Regulations for the Prevention of Air Pollution Emergency Episodes, APC-S-3 (MDEQ, 1988). Actions

include reduction or cessation of nonessential vehicle trips, engine operation, boiler operation, fire training, painting and corrosion control activities, construction work, research lab incinerator operation, and other electrical and fuel consumption activities (USAF, 1996a). An air emissions inventory was conducted at Keesler AFB in 1997 for stationary emissions (USAF, 1997b) and mobile emission from baseline airfield operations have been estimated (USAF, 1999c) (Table 3.5-2).

Table 3.5-2. Baseline Emissions Inventory at Keesler AFB

Criteria Air Pollutant (tpy)	CO	VOC	SO_x	NO_x	PM10	Pb
Keesler AFB Aircraft Emissions[a]	39.6	14.8	2.5	38.1	2.4	0.0
Stationary Emissions[b]	25.1	10.5	1.5	3.5	2.9	0.0
Emissions Totals	64.7	25.3	4.0	41.6	5.3	0.0

Sources: [a] U.S. Air Force, 1997b
[b] U.S. Air Force, 1999

3.5.2 Future Baseline Without the Project

Without the project, air quality conditions in the vicinity of the four proposed ASR-11 sites are expected to remain stable. During the planned construction associated with the facility reconfiguration, temporary increases in dust levels would occur.

3.6 GEOLOGY AND SOILS

3.6.1 Existing Conditions

General characteristics of soils and geology on the base are discussed in this section. Site-specific data relevant to the four alternative ASR-11 sites are provided, as available.

3.6.1.1 Geology. Keesler AFB is located within the Pamlico Plain, a major landform in the East Gulf subdivision of southern Mississippi. Flat or gently undulating terrain characterizes this landform, with elevations ranging between five and 35 feet above mean sea level (MSL). Correspondingly, ground elevations on Keesler AFB range from sea

level near the Back Bay of Biloxi, to approximately 30 feet above sea level near the southwest portion of the base. Depressions within the Pamlico Plain are generally wet and poorly drained.

The Gulf Coast Geosyncline, a large sinking trough of delta deposited sediments in the Gulf of Mexico, constitutes most of the regional geologic structure. The Gulf Coastal Plain consists of geologic formations that are wedge-shaped and tend to dip and thicken seaward. A gentle south/southwesterly dip of less than 30 feet/mile exists at sediment depths less than 2,000 feet; dips increase dramatically at greater depths located further toward the sea.

3.6.1.2 Soil Resources. The Biloxi Peninsula occupied by Keesler AFB contains several types of soils in both small and large parcels. Eustis and Harleston are the dominant soils overall, while the coastal marsh areas of the base are dominated by Handsboro and Eustis-Poarch soils (Figure 3.6-1).

Ninety-five percent of the base surface is comprised of Eustis, Eustis-Poarch, Harlston, and Lakeland soils, which are all formed on sandy or loamy upland materials. Eustis, Harleston, and Lakeland soils are found principally on ridge tops with gentle slopes of less than five percent. Eustis-Poarch soils are found in small parcels in slightly rougher areas with slopes of eight to 17 percent; these soils are well to excessively drained.

Permeability is rapid in the sandy Lakeland soils and decreases as the amount of loam increases. The least permeable of the soils is the Poarch component of the Eustis-Poarch areas, with a moderate to moderately slow permeability. Handsboro soils, found in the coastal marshes of the base, are organic soils formed in highly decomposed plant residues and thin mineral layers. Generally subject to the daily tidal fluctuations, these soils are moderately permeable and poorly drained.

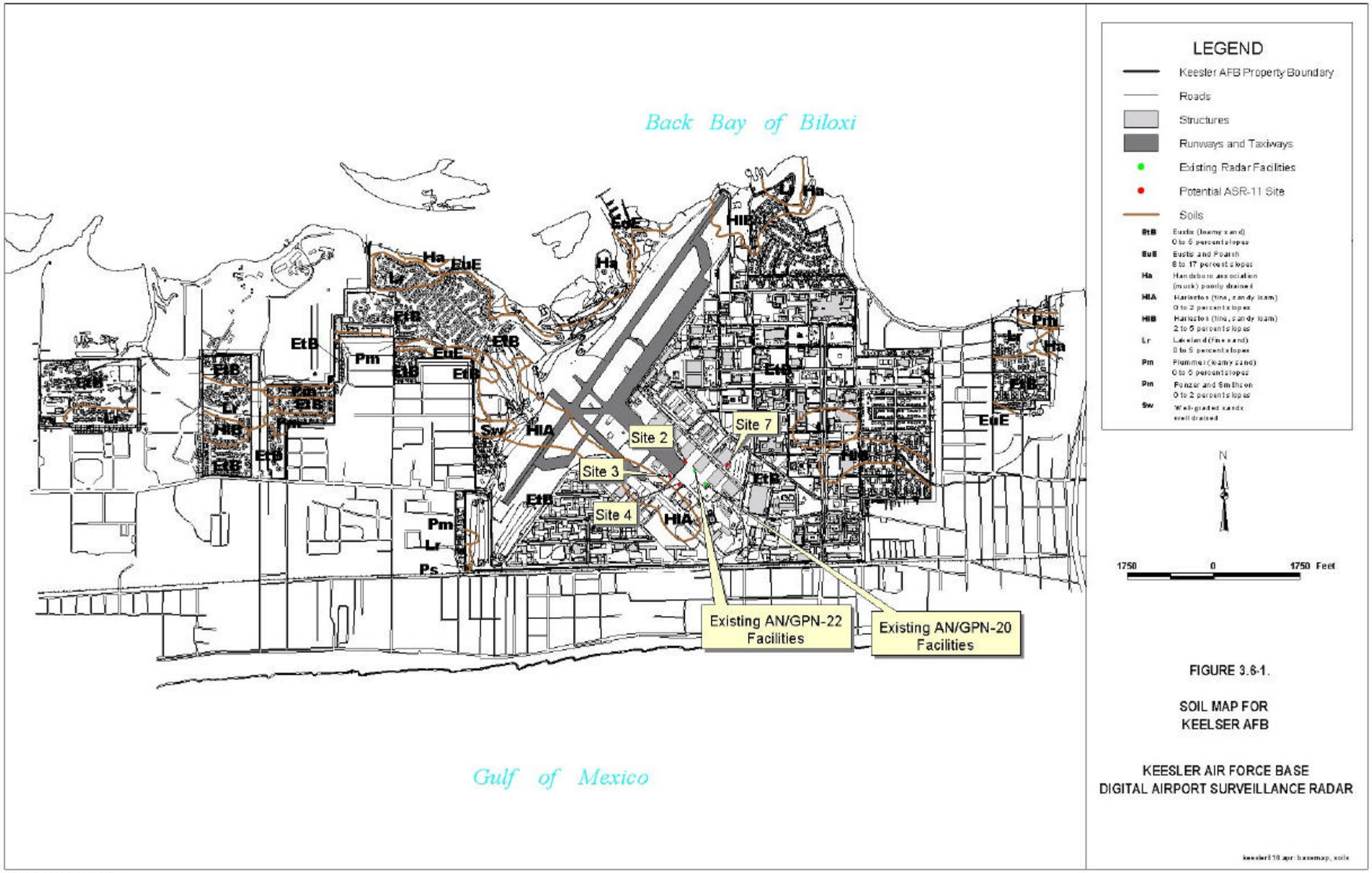


FIGURE 3.6-1.

SOIL MAP FOR
KEELSER AFB

KEESLER AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

Source: Keesler AFB

Due to the relatively flat contours of Keesler AFB, as well as the sandy nature of soils, erosion potential is low. Minimal shrink-swell potential exists for all soils except for the infrequent Ponzer soils.

Sites 2, 3, 4 and **7** are within Eustis soils, with zero to five percent slopes.

3.6.2 Future Baseline Without the Project

No changes in geologic formations, or existing soil types and locations are anticipated on Keesler AFB in the future without the project.

3.7 SURFACE WATER AND GROUNDWATER

3.7.1 Existing Conditions

Surface water and groundwater resources in the vicinity of Keesler AFB are discussed in this section. The characteristics for surface water and groundwater on the base are expected to generally describe the area around the four alternative ASR-11 sites.

3.7.1.1 Surface Water. The Back Bay of Biloxi is located along the northern edge of Keesler AFB. Back Bay is a tidal estuary with a surface area of approximately 10 square miles including Big Lake, located at its western end (Figure 3.7-1). Saline water enters the Back Bay from the Mississippi Sound. Five major sources contribute fresh water to the Back Bay of Biloxi including water from the Biloxi River basin, Tchoutacabouffa River basin, Bernard Bayou basin, Old Fort Bayou basin and Biloxi peninsula. Two larger tidal creeks, Bayou LaPorte and Keegan Bayou, are located to the west and east of the base, respectively. Smaller tidal creeks along the northern edge of the Base also provide drainage into the Back Bay of Biloxi. These creeks contribute small amounts of water during the dry months; however, after heavy storms, stormwater from the base fills the creeks that eventually discharge into the Back Bay of Biloxi. The fresh water contribution to the Back Bay of Biloxi almost doubles during the winter and spring months, as compared to summer flows.

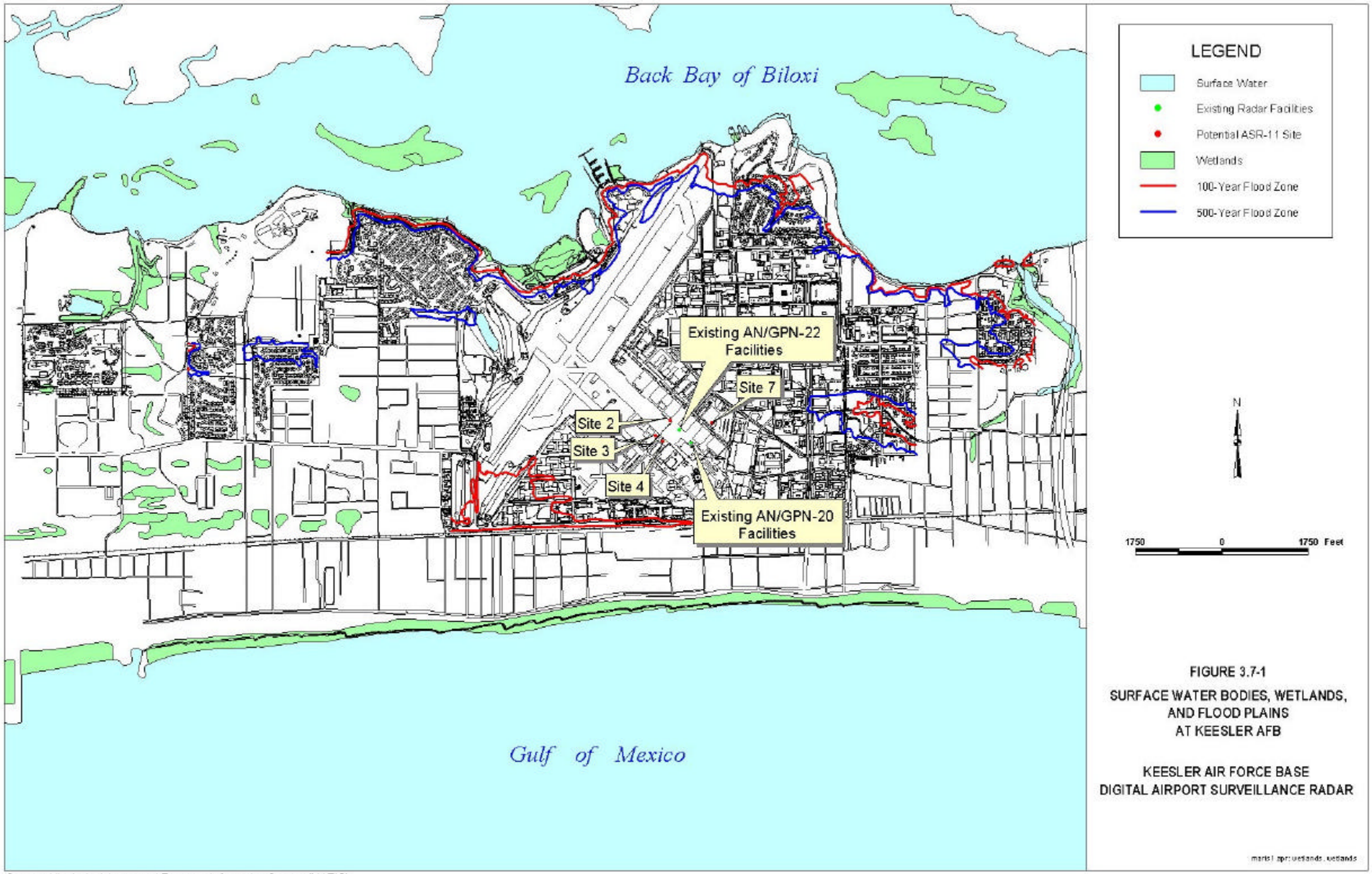


FIGURE 3.7-1

SURFACE WATER BODIES, WETLANDS, AND FLOOD PLAINS AT KEESLER AFB

KEESLER AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

Source: Mississippi Automated Resource Information System (MARIS); National Wetlands Inventory, Keesler AFB

Lotic systems within the base are limited to the two small manmade lakes located on the golf course. These lakes are fed by underground wells approximately 600-700 feet deep.

Stormwater from Keesler AFB is discharged via three primary routes. Sixty-four percent of the base's stormwater is released directly to the Back Bay of Biloxi, 27 percent of the base's stormwater drainage is released to the Back Bay of Biloxi through Bayou LaPorte and Keegan Bayou, and nine percent of the base's drainage is routed to Biloxi's storm sewer system, which empties into Mississippi Sound (USAF, 1996a).

No surface water bodies are within the vicinity of the alternative ASR-11 locations (**Sites 2, 3, 4** and **7**).

3.7.1.2 Groundwater. There are three aquifers in the area of Keesler AFB. The upper-most aquifer occurs within the Pamlico Sand. Pamlico Sand is composed primarily of sand and limestone of the Late Pleistocene and occurs from 0 to 10 feet below land surface and can range from 1 to 75 feet in thickness. On Keesler AFB, this groundwater has been encountered at depths of less than three feet below ground surface. The second aquifer is the Citronelle aquifer. This aquifer is the shallowest significant source of groundwater in much of southern Mississippi; however, because this aquifer comprises many discontinuous and hydrologically independent aquifers, the extent of this formation in the immediate vicinity of Keesler AFB is unclear. The main groundwater source within Keesler AFB, and the surrounding Gulf Coast area, is the Graham Ferry Formation located within the Miocene aquifer system. This formation is the result of sediments deposited during the Miocene and Pliocene periods. The sediment deposits vary in thickness from a few feet to several hundred feet and are separated by beds of clay or shale. Twelve wells on Keesler AFB withdraw water from this source. The water is tested regularly for contamination. The condition of the water is acceptable for municipal use (USAF, 1996a and 1999b; ACOE, 1999).

The groundwater level is reportedly four to five feet below grade in the area of all alternative ASR-11 locations (**Sites 2, 3, 4** and **7**) (USAF, 1996a and 2000e).

3.7.2 Future Baseline Without the Project

No substantial changes in surface or groundwater conditions are expected to occur in the future without the project. Implementation of Best Management Practices (BMPs) during normal activities on the base will help to reduce non-point source pollution from storm water that is discharged to the Back Bay of Biloxi.

3.8 BIOLOGICAL RESOURCES

3.8.1 Existing Conditions

This section contains descriptions of biological resources, including vegetation, wetlands and wildlife for Keesler AFB and its vicinity and for the proposed ASR-11 sites.

3.8.1.1 Vegetation. The growing season at Keesler AFB is from March 15 to December 15, or 269 days long. The base is mainly an urbanized installation, bordered by the City of Biloxi on the southern, eastern, and western sides. Back Bay of Biloxi borders the base to the north. Prior to development of the base, the area consisted of upland pine-oak forest (USAF, 1999c). Currently, approximately 728 acres of the 3,550 acres that comprise the base are planted lawns that are maintained year-round. These areas include the administrative, athletic and housing areas, and golf course fairways and greens. In addition to the lawn areas scattered around the base, planted ornamental trees are also present. Forested upland areas of the base are dominated by slash pine, red cedar, live oak, and magnolia trees. Table 3.8-1 lists vegetation commonly found on Keesler AFB including those species used for landscaping.

As mentioned above, the Back Bay borders Keesler AFB to the north. This area consists of marsh along the perimeter of the main water body. Wet areas on the base, usually associated with drainage areas that eventually discharge to Back Bay, contain red maple and black willow. Also found in the wetter areas are cattail, pennywort, and needlerush.

Table 3.8-1. Vegetation Commonly Found on Keesler Air Force Base Property

Scientific Name	Common Name
SHADE TREES	
Quercus virginiana	Live oak
Liquidambar styraciflua	Sweet gum
Magnolia grandiflora	Southern magnolia
Quercus nigra	Water oak
Quercus phellos	Willow oak
Quercus falcata	Southern red oak
Quercus shumardii	Shumard oak
Liriodendron tulipfera	Tulip tree
ORNAMENTAL TREES	
Betula nigra	River birch
Lagerstroemia indica	Crepe myrtle
Magnolia soulangeana	Saucer magnolia
Ilex vomitoria	Yaupon holly
Pyrus chillery and bradford	Bradford pear (flowering) shrubs
CONIFEROUS EVERGREENS	
Cedrus deodara	Deodar cedar
Juniperus chinensis pfitzeriana	Pfitzer juniper
Juniperus horizontalis plumosa	Andorra juniper
Pinus glabra	Spruce pine
Podocarpus macrophyllus maki	Yew podocarpus
EVERGREEN SHRUBS	
Azalea indicum	Azalea
Cleyera japonica	Cleyera
Nandina domestica	Nandina
Ilex vomitoria dwarf	Dwarf yaupon
DECIDUOUS SHRUBS	
Chaenomeles	Flowering quince
Spirea prunifolia	Bridal wreath spirea
Prunus glandulosa	Flowering almond
GRASSES	
Cynodon dactylon	Bermuda grass
Eremochloa ophiuroides	Centipede grass
Stenotaphrum secundatum	St. Augustine grass

Source: U.S. Air Force, 1995b

Site 2 is devoid of vegetation. **Site 3** and **Site 4** are covered with mowed grass. Small trees are located near Site 3, although they are not within the proposed limits of the site. **Site 7** is mostly concrete. A small strip of grass exists on the eastern portion of the site.

3.8.1.2 Wetlands. No wetlands exist within the main area of the base; however, along the northern boundary of the base, bordering the Back Bay of Biloxi, there are approximately 21 acres of wetlands (Figure 3.7-1) bordered by the golf course, the fire training area, and the marina (USAF, 1995b). On average, the wetland area is covered by 1.5 feet of water. Wetland areas of Keesler AFB are protected from encroachment; however, large areas within the flood plains are already developed (Figure 3.7-1).

There are no wetland areas in the vicinity of the alternative site locations.

3.8.1.3 Wildlife. The extensive development of Keesler AFB consisting of the construction of buildings and paving for roads, runways, and parking has limited the wildlife species found on the base. The predominant wildlife present are those species adapted to disturbance and development. The primary wildlife species found in the vicinity of the main base area are listed in Table 3.8-2 (USAF, 1999c).

Wildlife populations in the areas of the alternative sites are minimal due to the lack of habitat found in these general areas.

3.8.1.4 Threatened and Endangered Species. Threatened and endangered species of Harrison County are listed in Table 3.8-3. Due to the developed and heavily utilized nature of the alternative ASR-11 sites, no known threatened or endangered species have been identified in these areas (USAF, 1994b).

3.8.2 Future Baseline Without the Project

Without the project, the status of vegetation, wetlands, wildlife and endangered species is expected to remain similar to existing conditions in the areas of the proposed ASR-11 sites. In the future, the base is planning to reconfigure streets to allow for a more efficient use of the land and alleviate traffic control problems. Also, the base plans on expanding the training and medical facilities. Neither modification to the base will have an impact on existing biological resources.

Table 3.8-2. Wildlife Found in the Vicinity of the Main Base Area of Keesler Air Force Base

Scientific Name	Common Name
MAMMALS	
Procyon lotor	Raccoon
Oryzomys palustris	Rice rat
Sigmodon hispidus	Cotton rat
Rattus norvegicus	Norway rat
Mus musculus	House mouse
BIRDS	
Mimus polyglottos	Northern mockingbird
Passer domesticus	House sparrow
Toxostoma rufum	Brown thrasher
Cardinalis cardinalis	Cardinal
Cyanocitta cristata	Blue jay
Zenaida macroura	Mourning dove

Source: U.S. Air Force, 1994b

Table 3.8-3. Threatened and Endangered Species Occurring in Harrison County.

Scientific Name	Common Name	Federal Status	State Status
Pelecanus occoccidentalis	Brown pelican	Endangered	Endangered
Haliaeetus leucocephalus	Bald eagle	Threatened	Endangered
Accipiter striatus	Sharp-shinned hawk	None	None
Grus canadensis pulla	Mississippi sandhill crane	Endangered	Endangered
Charadrius melodus	Piping plover	Threatened	Endangered
Picoides borealis	Red-cockaded woodpecker	Endangered	Endangered
Thryomanes bewickii	Bewick's wren	None	Endangered
Trichechus manatus	Manatee	Endangered	Endangered
Acipenser oxyrinchus desotoi	Gulf sturgeon	Threatened	Endangered
Rana capito sevosa	Dusky gopher frog	None	Endangered
Caretta caretta	Loggerhead; cabezon	Threatened	Endangered
Lepidochelys kempii	Kemp's or atlantic ridley	Endangered	Endangered
Pseudemys spp.	Mississippi redbelly turtle	None	Endangered
Gopherus polyphemus	Gopher tortoise	Threatened	Endangered
Drymarchon corais couperi	Eastern indigo snake	Threatened	Endangered
Heterodon simus	Southern hognose snake	None	Endangered
Pituophis melanoleucus lodingi	Black pine snake	None	Endangered
Isoetes louisianensis	Louisiana quillwort	Endangered	None

Sources: Mississippi Natural Heritage Program, 1999 and 2000; Environmental Protection Agency, 1999; U.S. Fish and Wildlife Service, 2000

3.9 AESTHETICS

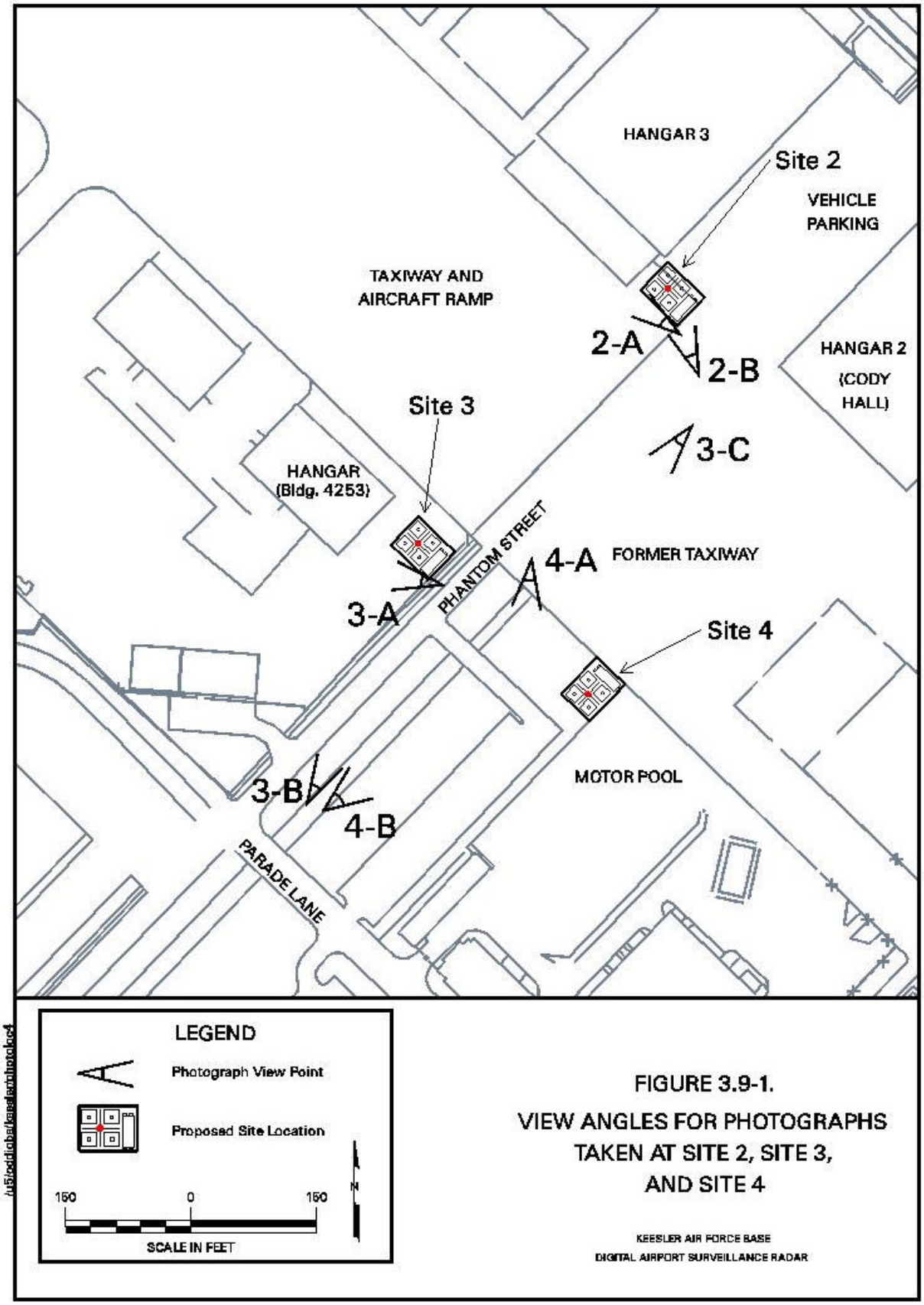
The purpose of this section is to characterize the aesthetic resources of the project areas to provide a framework for determining the potential changes that could occur as a result of the construction and operation of the ASR-11 at the alternative sites. Figures 3.9-1 and 3.9-2 display the locations from which photographs were taken during the site survey in January 2000.

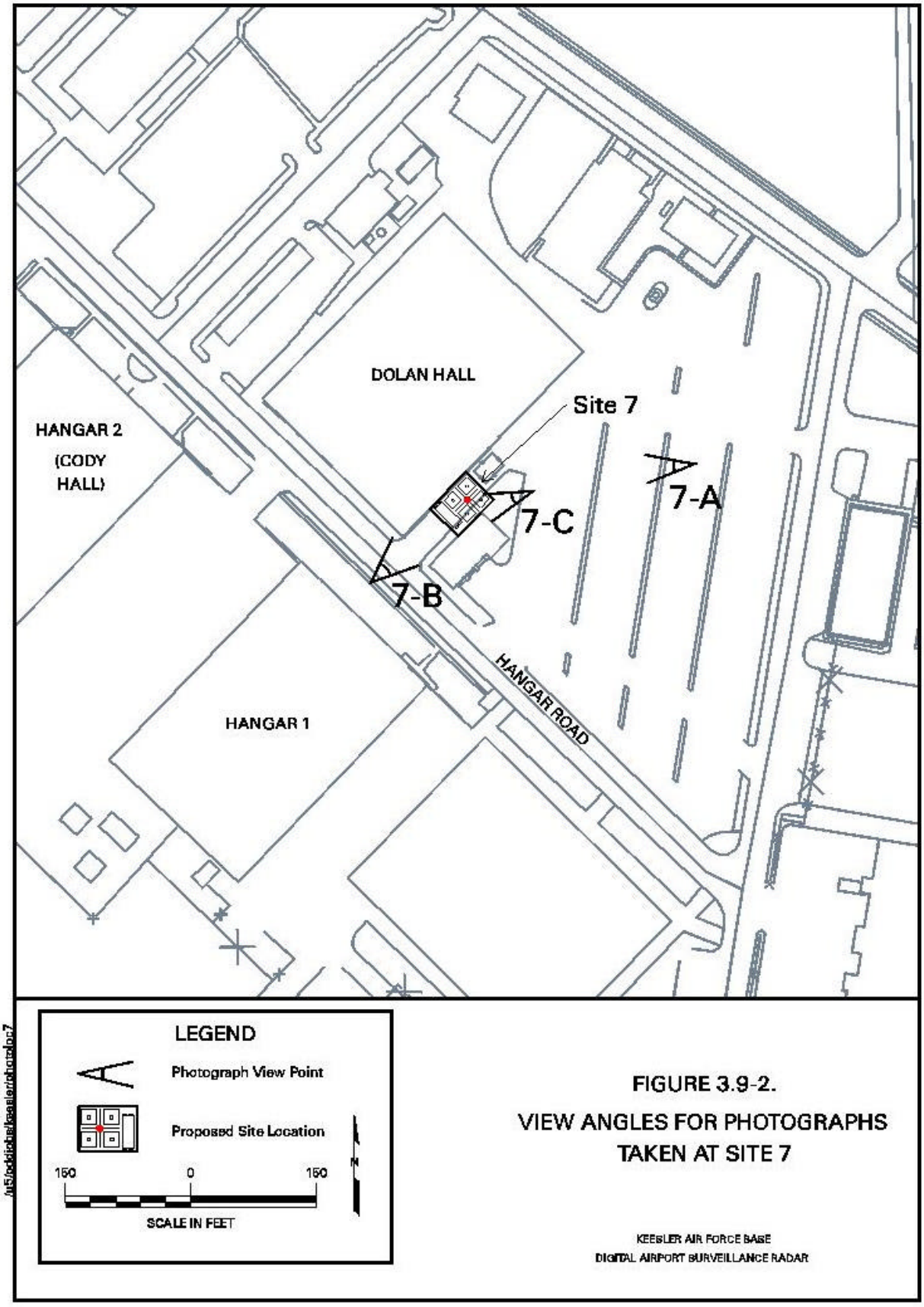
3.9.1 Existing Conditions

Keesler AFB is located on the Pamlico Plain, which is characterized as generally flat or gently undulating with elevations ranging from 5 to 30 feet above mean sea level. The base is free of substantial geographic features, as discussed in Section 3.6. Much of the base consists of developed areas used for aircraft operations, training, administration, medical services, and housing.

Runways, aircraft hangars, lights, antennae, and towers are considered an integral part of the functional aesthetic quality of the Keesler AFB landscape. These basic features and the typical base activities give the impression of an organized and functional military installation.

Aesthetic characteristics are similar for all four ASR-11 alternative sites, due to their close proximity to one another. All four sites are flat and located in the same general area as five existing radar systems (the two AN/GPN-20s that are being replaced and three AN/GPN-22s) in the 81st Training Wing Center. Part of the Keesler AFB transportation division (consisting of military vehicles parking) and personal vehicular parking are also located in the vicinity of the alternative sites. As described above, this portion of the base typifies the functional aesthetic quality of the air force base in general.


HANGAR 3
Site 2
VEHICLE PARKING
TAXIWAY AND AIRCRAFT RAMP
2-A
2-B
HANGAR 2 (CODY HALL)
Site 3
3-C
HANGAR (Bldg. 4253)
PHANTOM STREET
4-A
FORMER TAXIWAY
3-A
Site 4
MOTOR POOL
3-B
4-B
PARADE LANE
LEGEND
Photograph View Point
Proposed Site Location
150
0
150
SCALE IN FEET
N
FIGURE 3.9-1.
VIEW ANGLES FOR PHOTOGRAPHS TAKEN AT SITE 2, SITE 3, AND SITE 4
KEESLER AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR


DOLAN HALL
Site 7
HANGAR 2
(CODY
HALL)
7-A
7-C
7-B
HANGAR ROAD
HANGAR 1
LEGEND
Photograph View Point
Proposed Site Location
150
0
150
SCALE IN FEET
N
FIGURE 3.9-2.
VIEW ANGLES FOR PHOTOGRAPHS
TAKEN AT SITE 7
KEESLER AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

Site 2. Site 2 is located slightly west of Cody Hall, which is used for administrative and classroom purposes. The site contains a portion of a concrete area used for aircraft parking and movement. A section of airport perimeter fencing around a controlled access area crosses Site 2. The site is devoid of vegetation. Figure 3.9-3 shows various photographs of Site 2. View 2-A displays the site facing northwest from the perimeter fence. A concrete area with airplanes parked in the distance is visible in the photograph. View 2-B displays Site 2 facing towards the north. Hangar 3 can be seen on the right side of the photo.

Site 3. Site 3 is a controlled access area located approximately 400 feet southwest of Cody Hall, between the southeast end of Building 4253 (aircraft maintenance hangar) and Phantom Street. The primary vegetation in the area of Site 3 consists of mowed grass and five trees located between Building 4253 and the fence along Phantom Street. See Figure 3.9-4, View 3-A, View 3-B, and View 3-C for photographs of Site 3. Building 4253 can be seen at the right side of the photographs in View 3-A and View 3-C and in the center of View 3-B.

Site 4. Site 4 is located approximately 400 feet southwest of Cody Hall, south of Phantom Street and the parade walk adjacent to the street, and west of Building 4432. The site is also immediately west of a vehicle wash rack and a parking lot. Vegetation at Site 4 consists of mowed grass. See Figure 3.9-5, View 4-A and View 4-B for photographs of Site 4. In View 4-A, the site is in the grassy area on the left of the photo. In View 4-B, the site is to the right of the parade walkway adjacent to the parking lot. Cody Hall and Hangar 1 (Thomson Hall) can be seen in the distance, as can the existing AN/GPN-20s and the AN/GPN-22s.

Site 7. Site 7 is located approximately 200 feet northeast of Thomson Hall, between Dolan Hall (Building 2916) and a cooling facility building (Building 2921). The site is located on an area of mixed pavement and mowed grass. See Figure 3.9-6, View 7-A, View 7-B, and View 7-C for photographs of Site 7. View 7-A displays the east-facing

Figure 3.9-3 Photographs of Site 2 Taken During the January, 2000 Site Visit

View 2-A. Photograph of Site 2 taken towards the northwest through the perimeter fencing.

View 2-B. Photograph of Site 2 taken towards the north.

Figure 3.9-4 Photographs of Site 3 Taken During the January, 2000 Site Visit

Upper Left: **View 3-A**. Photograph of Site 3 taken from Phantom Street towards the west.

Above: **View 3-B**. Photograph of Site 3 taken towards the northeast, across Phantom Street.

Left: **View 3-C**. Photograph of Site 3 taken towards the southwest.

Figure 3.9-5 Photographs of Site 4 Taken During the January, 2000 Site Visit

View 4-A. Photograph of Site 4, taken towards the southwest. Site 4 is located to the left of the photograph.

View 4-B. Photograph of Site 4 towards the northeast toward Cody Hall. Site 4 is located to the right of the photograph.

Figure 3.9-6 Photographs of Site 7 Taken During the January, 2000 Site Visit

Upper Left: **View 7-A**. Photograph of Site 7 facing west. The east side of Dolan Hall can be seen straight ahead. The proposed alternative site is located between Dolan Hall and small utility building located on the far left side of the photograph.

Above: **View 7-B**. Photograph of Site 7 taken towards the northeast. Site is located between the utility Building and Dolan Hall.

Left: **View 7-C**. Photograph of Site 7 taken towards the southwest, between the utility building and Dolan Hall.

side of Dolan Hall, with Site 7 in the far left of the photograph. View 7-B and View 7-C show the locations of the alternative site between the cooling facility building and Dolan Hall towards the northeast and the southwest, respectively.

3.9.2 Future Baseline Without the Project

In the future without the project, there are no proposed activities on Keesler AFB in the vicinity of the alternative sites that would have the potential to substantially alter aesthetic conditions. The phased construction plan to demolish buildings, construct new buildings, and provide cover to currently open areas would be consistent with the base's functional aesthetic quality. Although the current location of the existing radar facilities (AN/GPN-20s and AN/GPN-22s) will be moved as result of construction, they will remain within the same general vicinity; thus, the functional aesthetic quality of the area will remain essentially unchanged.

3.10 CULTURAL RESOURCES

This section identifies cultural resources that have been identified at Keesler AFB and indicates if any known resource areas are located in the vicinity of the alternative ASR-11 sites.

3.10.1 Existing Conditions

3.10.1.1 Archaeological Sites. Keesler AFB completed a Cultural Resources Management Plan (CRMP) in 1996 (USAF, 1996b). The CRMP concluded that there are no prehistoric or historic archeological sites on Keesler AFB, based on field investigations and historical map and photograph reviews. The plan notes that intensive construction on the majority of the base property has disturbed any archaeological sites that may have existed (USAF, 1996b).

No archaeological resources are located in the vicinity of the four alternative sites.

3.10.1.2 Historic Structures. One building, Facility 228, on Keesler AFB is eligible for listing on the National Register of Historic Places (NRHP). This building, known as the Old Biloxi Hangar, dates to the 1930s and its construction has not been substantially altered. The Mississippi Department of Archives and History (MDAH) has recommended that the base nominate this building for listing on the NRHP. The MDAH has also recommended that Keesler AFB base retain Building 3204, a World War II barracks. This building, although not eligible for listing on the NRHP, will be used by the base as a heritage center.

No historic structures are located in the vicinity of the four alternative sites. Facility 228, the only facility on Keesler AFB eligible for listing on the NRHP, is located approximately 3000 feet from the alternative ASR-11 sites.

3.10.2 Future Baseline Without the Project

It is not anticipated that there would be any substantial change in cultural resource conditions at the alternative sites in the future without the project due to the absence of cultural resources in the respective areas.

3.11 POLLUTION PREVENTION AND HAZARDOUS WASTE

3.11.1 Existing Conditions

The following sections describe current conditions and practices on the Keesler AFB with regard to pollution prevention and hazardous waste.

3.11.1.1 Pollution Prevention. The Air Force has developed a Pollution Prevention Program (PPP) to comply with the Pollution Prevention Act of 1990. All USAF installations have incorporated the following principle requirements into their PPP:

- Generation of hazardous substances, pollutants, or contaminants will be reduced or eliminated at the source whenever feasible (source reduction).

- Pollution that cannot be prevented will be recycled in an environmentally safe manner.

- Disposal, or other releases to the environment, will be employed only as a last resort and will be conducted in an environmentally safe manner, according to regulatory guidance.

AFI 32-7080, dated May 12, 1994, provides the directive requirements for the Air Force PPP. All Air Force installations must incorporate the requirements of AFI 32-7080 into a Pollution Prevention Management Plan (PPMP) and a Pollution Prevention Management Action Plan (PPMAP). The PPMAP gives an overview of how a base will implement its PPMP, determine the program of funding for the PPP, describe the goals of Air Force's PPP, and the necessary steps needed to execute the PMPP. The PPMAP uses the following guidelines to meet the requirements of the Air Force PPP:

- Reduction of Ozone Depleting Substances (ODSs), which include the complete elimination of all Class I ODSs and reduction of Class II ODSs by a specific target date using the calendar year 1992 (CY92) as the baseline.

- Reduction of hazardous waste disposal by 50 percent by the end of CY99 from a CY92 baseline. To obtain these reductions, source reduction should be used whenever possible followed by reclamation and recycling.

- The DoD objective to reduce municipal solid waste generation at the end of CY97 by 50 percent from the CY92 baseline was achieved earlier than anticipated. Subsequently, the DoD has developed new guidelines effective CY99 that will require all installations to recycle 40 percent of their non-hazardous solid waste by the end of CY05, and ensure that an integrated non-hazardous solid waste management program provide economic benefit when compared with disposal using landfilling and incineration (DoD, 1998 as referenced in USAF, 1999c).

- Incorporation of Executive Order 13101 *Federal Acquisition, Recycling, and Waste Prevention Requirements* to ensure the Federal government's further use of recycled products and environmentally preferable products and services.

- Implementation of energy conservation in accordance with Executive Order 12902 *Energy Efficiency and Water Conservation at Federal Facilities*, including reduction of facility energy use 10 percent by the end of CY94, 20 percent by the end of CY99, and 30 percent by the end of CY04 using the CY85 consumption as the baseline. The value used to measure the progress in reducing energy consumption is measured in MMBtu/ft^2.

Keesler AFB has a PPMAP in place, which incorporates appropriate management, measurement, and reporting goals to comply with the overall Air Force PPP. Table 3.11-1 lists five different categories of pollutants that have been reduced or are required to be reduced under the Air Force PPP, and their status at Keesler AFB. While the reduction of ODSs by 50 percent was part of the original Air Force PPP, the Air Force has exceeded the original 50 percent reduction goal; therefore, the current goal is to eliminate all ODS compounds as soon as possible (USAF, 1999c). All compounds under the USEPA 33/50 Industrial Toxics Program (EPA 17 industrial toxics) fall under the Emergency Planning and Community Right-To-Know Act (EPCRA). The Air Force PPP required that such compounds should be reduced by 50 percent by the end of CY96. Hazardous waste compounds at Keesler AFB were reduced by 50 percent by the end of CY99 from a CY92 baseline. Energy consumption was supposed to be reduced by 20 percent by the end of CY99.

Table 3.11-1 Pollution Prevention Baseline and CY99 Values for Keesler AFB

Pollution Prevention Program Elements	ODS[a] (lbs)	EPCRA[b] (lbs)	Hazardous Waste (lbs)	Municipal Solid Waste (tons)	Energy ($MMBtu/ft^2$)
Baseline Quantity	N/A	4,109,515	65,836	12,343	0.124
Goal	N/A	2,054,758	32,918	6,172	0.099
CY99 Quantity	N/A	14,500[c]		6,900	Information Not Available

N/A = Not Applicable

[a] A baseline quantity for ODS (Ozone Depleting Substances) is not applicable since the Air Force has exceeded the original 50 percent reduction goal; therefore, the current goal is to reduce all ODS purchases as soon as possible.
[b] EPCRA are compounds listed under the Emergency Planning and Community Right-To-Know Act.
[c] 1999 EPCRA and hazardous waste amounts have been combined by Keesler AFB (USAF, 2000e)

Sources: U.S. Air Force, 1999c; U.S. Air Force, 2000e

3.11.1.2 Hazardous Waste. Keesler AFB is considered a municipal large quantity generator of hazardous waste. All hazardous waste is regulated under the Resource Conservation and Recovery Act (RCRA) Subtitle C (40 CFR Parts 260 through 270) by the USEPA, unless otherwise exempted by Comprehensive Environmental Response,

Compensation, and Liability Act (CERCLA) regulations. Within the state of Mississippi, hazardous waste is regulated and enforced by the Mississippi Department of Environmental Quality (MDEQ). All hazardous waste from Keesler AFB is handled, stored, transported, disposed, or recycled in accordance with both USEPA and MDEQ regulations (USAF, 1999c).

Keesler AFB currently has a Part B RCRA permit for the storage and handling of hazardous waste. Types of hazardous waste materials produced at the base include spent solvents, thinners, strippers, paint waste, laboratory chemicals, and unused materials that may contain hazardous waste and have exceeded their shelf-life. Materials such as used motor oil, turbine oil, hydraulic fluid, antifreeze, batteries, and florescent lights are transported to an off-base recycling facility. There are 15 hazardous waste storage and accumulation and satellite accumulation points on the base. The waste is collected at the satellite accumulation points and once the containers are filled the material is transported to a 90-day accumulation point. At the 90-day holding point materials are analyzed, identified, and prepared for shipment, after which the material is sent to the Defense Reutilization and Marketing Office (DRMO) located at Building 4420, to await final reuse or disposal (USAF, 1999c).

Past activities at DoD installations have led to the release of hazardous waste materials. Due to these past activities, Keesler AFB has implemented an Installation Restoration Program (IRP). The IRP requires each military installation to identify, investigate, and remediate hazardous waste disposal and/or spill sites. Initially, 71 IRP sites and 15 areas of concern were identified at Keesler AFB. Of these sites, all sites have been closed or eliminated from further investigation with the exception of the six active IRP sites listed in Table 3.11-2 (Figure 3.11-1) and an additional six sites that are under Long-Term Monitoring with Land Use Controls.

One closed IRP site known as ST-16, which consists of an abandoned fuel line, is located 100 feet north of **Sites 3** and **4**. Although this site was closed in 1997 and requires no further action per EPA and MDEQ (USAF, 2000f and 2000g) there is a possibility

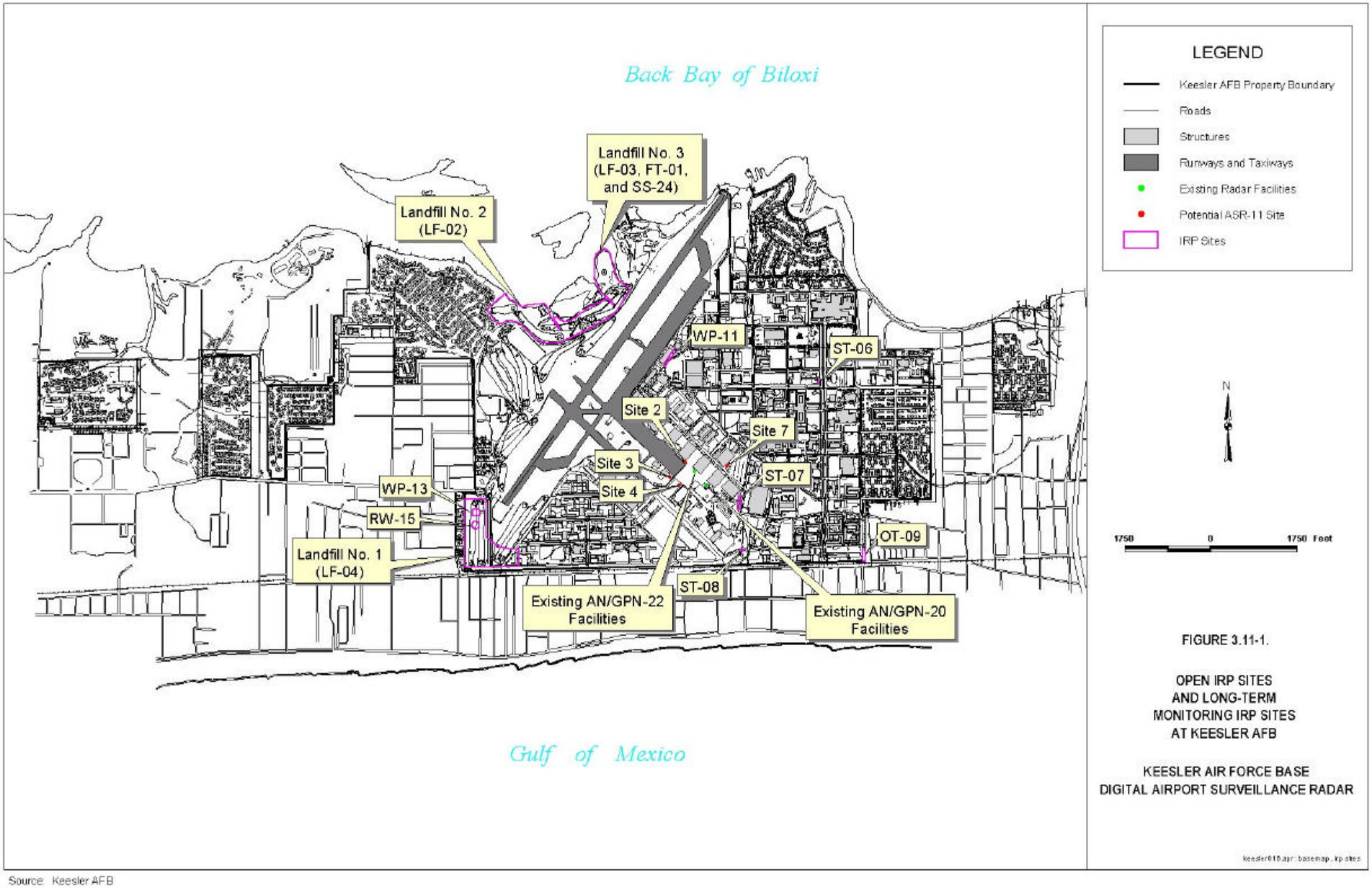


FIGURE 3.11-1.

OPEN IRP SITES
AND LONG-TERM
MONITORING IRP SITES
AT KEESLER AFB

KEESLER AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

keesler816.apr : basemap , irp sites

Source: Keesler AFB

Table 3.11-2. Installation Restoration Program Site Status, Keesler AFB

Number	Description	Site Status
LF-03	Landfill 3 and Associated Sites	Open - ISM – In Progress
FT-01	Old Fire Protection Mock-Up Area	Open - CMS – In Revision; LTM and Evaluation
SS-24	Asphalt Sealant Spray Area	Open - CMS – In Revision; LTM and Evaluation
WP-11	Etching Shop and Silver Recovery Area	Open - DD/SB – In Revision; LTM
OT-09	Old CE Storage Area	Open - DD/SB – In Revision; Land Use Controls
LF-02	Landfill 2 and Associated Sites	Open - LTM; Land Use Controls
ST-07	Old Military Service Station USTs	DD/SB – In Revision; LTM and Land Use Controls
ST-08	Building 4038 Abandoned UST	ISM – Complete; Monitoring Natural Attenuation
ST-06	BX Service Station Abandoned UST	ISM – In Progress; Monitoring Natural Attenuation
LF-04	Landfill 1 and Associated Sites	CMS – In Revision; LTM and Evaluation
WP-13	TEL Sludge Disposal Site	CMS – In Revision; LTM and Evaluation
RW-15	Low-Level Radioactive Waste Vault	CMS – In Revision; LTM and Evaluation

CMS – Corrective Measures Study
DD/SB – Decision Document/Statement of Basis
ISM – Interim/Stabilization Measure
RFI – RCRA Facility Investigation
LTM – Long Term Monitoring

Source: U.S. Air Force, 2000g

that fuel and fuel vapors exist below the ground surface (USAF, 2000f). None of the monitoring wells at this closed IRP site has revealed free product and no groundwater plume has been detected (USAF, 1999d). Another IRP site, ST-7, (Old Military Service Station USTs) is in the vicinity of the four alternative locations for the new ASR-11 radar (Figure 3.11-1). The IRP site is located approximately 600 feet southeast of **Site 7** and approximately 1,200 feet east-southeast of **Sites 2** and **4**. **Site 3** is the farthest from the ST-7 IRP location, at an approximate distance of 1,350 feet. The ST-7 IRP site is located approximately 750 feet west of the existing AN/GPN-20 radar sites. No groundwater plume was detected at this site. In addition, the site is now covered with asphalt and is part of "Z" Street.

3.11.2 Future Baseline Without the Project

It is anticipated that remediation of past hazardous waste sites will continue, as well as management of hazardous materials and newly generated wastes. Continuing pollution prevention measures on the base may reduce potential for new sources of contamination to arise at the alternative ASR-11 sites.

3.12 ELECTROMAGNETIC ENERGY

Electrical currents and components generate electrical fields and magnetic fields. These may be stationary or dynamic. Depending on the equipment, electromagnetic radiation that propagates outward may be created. Electromagnetic radiation, electrical fields and magnetic fields are localized effects. The electromagnetic environment at a particular location and time is the sum of all the localized electric and magnetic fields plus electromagnetic radiation arriving from both natural and manmade sources. Electric fields, magnetic fields, and electromagnetic radiation are of interest to the base because of the potential for health effects from some frequency ranges, and the potential for electromagnetic interference on other electronic equipment.

3.12.1 Existing Conditions

Electromagnetic radiation, magnetic fields and electrical fields is discussed in detail in the sections below.

3.12.1.1 Electromagnetic Radiation. Electromagnetic radiation is produced on Keesler AFB due to the presence of two AN/GPN-20 radar systems and three AN/GPN 22 systems. Electromagnetic radiation travels at a uniform speed (3×10^8 m/sec in a vacuum; the speed of light). It is often useful to consider electromagnetic radiation as a wave, and to describe it in terms of frequency (where 1 Hz means 1 cycle per second and 1 kHz means 1000 cycles per second). Some parts of the electromagnetic spectrum are more commonly described in terms of wavelength, which is inversely related to frequency.

The spectrum of electromagnetic radiation includes visible light, which has frequencies on the order of 5×10^{14} Hz (specifically, wavelengths from 400 nanometers (nm) to 760 nm). Electromagnetic radiation with frequencies higher than that of visible light include ultraviolet light, X-rays, and gamma-rays. These types of electromagnetic radiation are described as "high energy" and have the potential to "excite" electrons, to thereby ionize molecules, and to thus affect body chemistry. Especially in highly absorbed doses, high frequency electromagnetic radiation can adversely affect health (NSC, 1979).

Electromagnetic radiation with frequencies lower than that of visible light include infrared light and radio waves. Frequencies below 10^{12} Hz (10^6 MHz) are categorized as radio waves. These include frequencies used for AM radio; short-wave, television, and FM broadcast bands; pagers; cellular telephones; mobile radios; radar; and microwave technologies. These frequencies are non-ionizing, and have the following known health effects: (1) effects caused by directly heating body tissues and (2) electromagnetic interference with electronic medical devices such as pacemakers.

The heating of tissues caused by exposure to radio frequency radiation (RFR) at relatively low incident power densities can normally be accommodated. However, in some tissues, heat produced at higher radiation intensities may exceed temperature regulating mechanisms so compensation for heat gain may be inadequate. Thus, exposure at high intensities can cause thermal distress or irreversible thermal damage. Eye tissues are particularly vulnerable to this type of damage (NSC, 1979).

Electromagnetic interference with medical devices has become an issue because medical devices increasingly use sensitive electronics at the same time that RFR and other electromagnetic sources are proliferating (FDA, 1996). Medical equipment which may be susceptible to interference from RFR includes cardiac pacemakers, defibrillators, ventilators, apnea monitors, and electric wheelchairs (VTDPS, 1996; IEEE, 1998). Medical device manufacturers are expected to design and test their products to ensure conformance with standards for protection against radio frequency interference (IEEE, 1998). Nevertheless, users of medical devices are generally advised to keep RFR emitters as far away from their devices as is practical (IEEE, 1998).

There is currently considerable interest on the part of some researchers, the news media, and the public regarding the possibility of other health effects from non-ionizing radiation (and/or other electrical or magnetic fields). However, there is no scientific consensus that non-ionizing radiation presents any other health risks (USAF, 1995a) and no consensus about a mechanism by which non-ionizing radiation could have any such effects (i.e., effects other than those associated with heating of tissue and interference with medical devices).

Although the existing AN/GPN-20 systems are used solely for training purposes at Keesler AFB, the equipment at the AN/GPN-20 radar systems is identical to those in the field (i.e. units used at other DoD sites for air traffic control)(USAF, 2000h). Therefore, the existing systems, including the AN/GPN-22s, emit electromagnetic radiation in the radio frequency range. Locations close to and directly in front of the antenna (whether rotating or stationary) are considered unsafe when the radar is operating, on the basis of the potential for heating of body tissues. Similarly, the tower immediately below the antenna is considered unsafe. The intensity of the radar energy diminishes with distance, so there would be less tissue heating at greater distances. Since two AN/GPN-20 systems are in place at Keesler AFB, the height of the towers has been staggered to avoid interference and combined electromagnetic radiation that may occur at the same elevation. Also, the AN/GPN-20s are "blanked out" in the areas where their signals cross the AN/GPN-22 signals in order to avoid interference and combined electromagnetic radiation. Due to their stationary position aimed directly overhead, the electromagnetic radiation produced by the existing AN/GPN-22s is not considered to present a hazard. (USAF, 2000b and 2000h).

Within electronic systems for radar, any high-voltage tubes capable of emitting X-rays are typically shielded with lead, and shielding on other equipment is typically adequate to limit transmitted radiation to acceptable levels. While there are unshielded components present at the radar sites such as incandescent light bulbs, there is no indication or expectation that significant levels of electromagnetic radiation other than RFR are emitted into the environment by the radar systems.

3.12.1.2 Magnetic Fields and Electric Fields. Magnetic fields and electric fields other than electromagnetic radiation are also created by electrical equipment. In everyday situations, high-voltage power lines, televisions, computer monitors, fluorescent lights, light dimmer controls, improperly grounded equipment, and appliances used with non-polarized extension cords create measurable electric fields. Transformers, alternating current (A/C) adapters, motors (e.g., analog clocks and kitchen appliances), power lines, vehicles, and old electric blankets create measurable magnetic fields.

The presence of various electrical components in the AN/GPN-20 radar system inevitably means that there are a variety of magnetic and electrical fields in the vicinity of the AN/GPN-20 equipment. As noted above, there is currently considerable interest on the part of some researchers, the news media, and the public regarding the possibility of health effects from electrical or magnetic fields. However, no scientific consensus exists that electrical or magnetic fields present health risks other than those associated with medical devices. A 1996 National Academy of Science report, *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields,* concluded that:

> *The current body of evidence does not show exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects.* (National Academy of Science, 1996)

3.12.2 Future Baseline Without the Project

Without the project, the future electromagnetic field conditions in the vicinity of the four ASR-11 sites and the existing radars are expected to remain similar, but not identical, to those currently present. The planned construction activity within the Technical Training Center will require relocation of all five existing radar systems on base. The planned relocation position is within the same vicinity of the existing sites. A High Bay will be constructed over the paved area between Hangar 1 and Hangar 2 and the existing radars will be moved east to just outside of the High Bay area (Figure 3.1-2). The area will remain an active training area following construction and the electromagnetic field characteristics in the area will not be significantly altered.

4.0 ENVIRONMENTAL CONSEQUENCES

The No Action alternative would leave existing radar systems and air traffic control equipment in place. In addition, no new construction, renovation, or operations would be required. Since the no action alternative would involve no alteration to any of the four proposed ASR-11 sites at Keesler AFB, this alternative would result in no impact to environmental resources. Thus, the environmental consequences of the No Action alternative would result in identical conditions to those identified in Section 3.0, Future Baseline without the Project. However, selecting the No Action alternative, and thereby having to maintain the existing AN/GPN-20s as the main training components would eliminate the potential of training military personnel in the maintenance and operation of new DASR technology that is replacing existing technology at various DoD locations. The existing radar equipment used for training is not capable of meeting future user requirements for transmitting digital signal data to new digital automation system air traffic controller displays. The existing facilities also do not meet user requirements for increased target detection, weather reporting and improved reliability. This improved technology will be used throughout the country, and knowledgeable personnel are required to operate and maintain the ASR-11. Keesler AFB can provide the proper training to appropriate personnel that will work with this new radar system.

The proposed action would involve the construction of two new ASR-11 facilities. Potential impacts associated with the action alternative involve those resulting from construction (short-term) and operation (long-term) of the DASR systems. The potential impacts are described in this section for each of the alternative ASR-11 sites (Site 2, Site 3, Site 4, and Site 7). Impacts are presented by environmental parameter. Mitigation measures that may be required to reduce impacts are described in Section 6.0.

4.1 LAND USE

4.1.1 Short-term Impacts

Short-term impacts associated with the construction of the ASR-11s would include temporary disruption of land uses due to elevated noise levels, increased dust, interference with roadway access, and visual effects. Construction of the ASR-11 facilities would also include the installation of a temporary construction staging area approximately 75 feet by 100 feet adjacent to the ASR-11 site. This staging area would be used by construction personnel to store equipment for use during construction of the ASR-11. Construction of an ASR-11 at any of the four alternative sites would have minimal impacts on land use. The sites are located in aircraft operations and maintenance areas, technical training areas, open space, and bordering airfield pavement areas. DASR construction activities would be unlikely to disrupt current land usage or general operations in these areas. Likewise, construction activities would be unlikely to disrupt the proposed training area improvements.

The installation of utilities, such as power, telephone, and fiber optic cable to each of the sites could temporarily affect land uses along the proposed alignment routes. While specific alignments would not be defined until final design, it is anticipated that land uses along the alignments would be affected by elevated noise levels and increased dust associated with open trench excavation. Impacts associated with the installation of utilities for the proposed ASR-11 sites would be expected to be minimal and similar due to their locations in the same general area and nearby utility access for all four sites.

Although ASR-11 installations may occur simultaneously to the proposed construction activities associated with the base training area improvements, installation of the ASR-11s at any of the four alternative site locations is not anticipated to interfere with the proposed improvements. The sites are located outside the areas of proposed construction. Likewise, the proposed training facility improvements are not anticipated to interfere with the installation of the ASR-11s at any of the alternative sites.

4.1.2 Long-term Impacts

Installation of the ASR-11s at any of the four alternative sites would be generally compatible with the surrounding land uses. **Site 2** and **Site 3** are located within the perimeter fencing of a "Controlled Access" area. Site 2 is bisected by the fencing, while Site 3 is wholly located within the fencing. Permanent relocation of these fences may be required if these sites are selected. Alternative site locations were selected taking into consideration proposed training facility improvements. Placement of an ASR-11 at any of the alternative locations would not interfere with the ongoing training facility improvements and would remain consistent with the surrounding land uses after completion of the improvements, especially considering that operation and maintenance of the base radars is a component of the training program. The new radars will be situated in a manner to avoid interference with the existing AN/GPN-20s and the three AN/GPN-22s.

4.2 SOCIOECONOMICS

4.2.1 Short-term Impacts

Construction of the ASR-11s at any of the four alternative sites would require similar work efforts, and would, therefore, have similar effects on socioeconomic conditions at the base and the surrounding area. Construction at **Site 2, Site 3, Site 4**, or **Site 7** would not adversely impact the socioeconomic conditions at Keesler AFB. A slight short-term increase in the revenue generated in the surrounding area would occur due to construction employees utilizing local businesses for supplies and personal use. During the construction period, the work crew would consist of approximately 10 persons.

4.2.2 Long-term Impacts

In the absence of other independent activities at Keesler AFB, socioeconomic conditions would return to the existing conditions once radar construction is completed. Though the new radar facilities would not be staffed and would not impact socioeconomic conditions in this capacity, the installation of the radars would allow the base to enhance its training capabilities. As a result, the new radars would contribute to the viability of the training program at Keesler AFB.

4.2.3 Environmental Justice

Under its instructions for the Environmental Impact Analysis Process (32 CFR Part 989), the Air Force must demonstrate compliance with Executive Order 12898, entitled *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, to determine the effects of Federal programs, policies, and activities on minority and low income populations.

As stated in Section 3.2, the main portion of Keesler AFB is located within Census Block Group 000900-9 while nine other census blocks surround the main base area. The income and ethnicities of the populations within these nine block groups are generally comparable with each other and with those for the city of Biloxi, Harrison County, and the state of Mississippi. All sites are located substantially within the base perimeter and away from civilian populations. The closest census block group to any of the alternative sites is 000600-3, which is approximately 1,600 feet from Site 4, 1,800 feet from Site 3, and greater than 2,000 feet from the other alternative sites. The population within Census Block Group number 000600-3 is not uncharacteristic of the surrounding population with regard to income or ethnicity.

As demonstrated in other parts of Section 4.0, the proposed ASR-11 installations are not expected to have significant human health or environmental impacts. The proposed ASR-11 sites are distant from civilian populations; therefore, the proposed project is not expected to pose adverse health or environmental impacts to residents of adjacent neighborhoods, regardless of income or ethnicity. Thus, the proposed project is consistent with the objectives of Executive Order 12898.

4.3 UTILITIES AND TRANSPORTATION

The following sections describe potential short- and long-term effects of the installation of the ASR-11 radar systems on existing base utilities.

4.3.1 Short-term Impacts

Various lengths of open trench excavation would be needed to provide utility connections, such as electrical, telephone, and fiber optic for the ASR-11 future operations (Table 4.3-1). Above-

ground utility connections are unlikely to be installed due to the ongoing project at Keesler AFB to place all utility service lines underground. However, the above-ground option is evaluated for **Site 2** due to existing structural constraints, including inaccessible underground ducts. Site 2 also contains an overhead utility line between Hangar 2 and Hangar 3. This line would need to be relocated if Site 2 was chosen as the preferred location. If **Site 7** were chosen, then a cooling facility line, connected to the cooling facility, would need to be relocated in addition to the sewer line noted in Section 3.3.1.2. Operation of the ASR-11 facilities would not require water or wastewater services, although these utilities will be required, to a limited extent, during construction.

Table 4.3-1. Required Lengths of New Utility Connections

ASR-11 Alternative Site	Length Of Electric Power Conduit Required	Length Of Telephone Cable Required	Length Of Fiber Optic Cable Required
Site 2	60 Feet[(1)]	80 Feet	80 Feet
Site 3	90 Feet	250 Feet	200 Feet
Site 4	650 Feet	Adjacent To Site	520 Feet
Site 7	50 Feet	140 Feet	30 Feet

[(1)] Above-ground connection.

4.3.1.1 Water Supply. A temporary increase in water demand would occur during construction. A water source would be supplied on site by mobile water tanks. It is not anticipated that the water demand (for both workers' personal needs and dust control) during construction of each ASR-11 would adversely impact the water supply of Keesler AFB due to the limited number of construction workers, short construction period, and the adequate water supply.

4.3.1.2 Wastewater Treatment. There would be an insignificant short-term increase in demand for sewage treatment during construction. Portable wastewater units would be on site and waste would be transported to the nearby treatment facility. However, if Site 7 is chosen as one of the new ASR-11 locations, then a sewer line may need to be re-routed depending on the depth of the pipeline. The exact depth of this pipe is unknown and would have to be determined during the design phase of the project.

4.3.1.3 Solid Waste. Installation of the ASR-11 systems at **Site 2** would require removal and disposal of 18-24 inches of pavement. In addition, construction of the ASR-11 at **Site 2** or **Site 7** would require removal and disposal of concrete. All solid waste would be handled in accordance with standard base procedures. Any hazardous materials would be disposed of following Keesler AFB policies and protocols and relevant state and federal regulations (see Section 4.11 for the hazardous waste discussion).

4.3.1.4 Electricity. Adequate electrical power is available for each of the alternative ASR-11 sites. When possible, electrical power lines would be run underground through existing utility conduits. **Site 2** is the only alternative site that would use overhead power lines to connect to a power supply for the ASR-11 radar system. An overhead line would run approximately 60 feet from Site 2 to Hangar No. 3. An underground power line would be installed from Building 4253 to **Site 3**, at a distance of 90 feet. An underground power line would run from Parade Lane to **Site 4**, at a distance of 650 feet. An underground power line would run from a substation to **Site 7**, at a distance of 50 feet. An additional concern at Site 7 is the existing grounding grid for Dolan Hall. The grid is located within the site limits and alternative arrangements to relocate this facility would be required. Short-term disruption in power supply to the immediate area around the alternative ASR-11 sites is expected while electrical connections are made. The existing AN/GPN-20 and AN/GPN-22 radar systems will remain in service after the new ASR-11 radar systems are installed. This may cause a minimal increase in electrical demand while the radar systems are operating simultaneously.

4.3.1.5 Telephone. Telephone lines would be extended from the existing locations identified in Section 3.3.1.5. The final route and distance to the new ASR-11 sites will be determined when the final sites and designs are selected. Telephone line connections to **Site 2** can be made at Hangar No. 3, at a distance of 80 feet. Telephone line connections to **Site 3** can be made at the NDI laboratory, at a distance of 250 feet. Telephone line connections to **Site 4** are adjacent to the site, so no additional lines would need to be installed; however a telephone riser will require relocation. Telephone line connections to **Site 7** can be made at Hangar Road, at a distance of 140 feet. No disruption to telephone service in the immediate area of the alternative ASR-11 sites is expected during construction.

4.3.1.6 Fiber Optic Cable. Fiber optic cable would be run through newly constructed conduits. Fiber optic cable connections must be made from each alternative site to Hangar No. 2, the NDI Laboratory, or Dolan Hall. Fiber optic cable connections to **Site 2** can be made at Hangar No. 3, at a distance of 80 feet. Fiber optic cable connections to **Sites 3** and **4** can be made at the NDI Laboratory, at a distance of 200 and 520 feet, respectively. Fiber optic cable connections to **Site 7** can be made at Dolan Hall, at a distance of 30 feet. No disruption to fiber optic communications is expected in the immediate area of the alternative ASR-11 sites during construction.

4.3.1.7 Natural Gas. Natural gas is not required for the installation of the proposed ASR-11 radar. Also, no gas lines occur in the vicinity of the four alternative ASR-11 radar sites. Therefore, no impacts to the natural gas service on Keesler AFB are expected to occur as a result of the proposed action.

4.3.1.8 Transportation. Impacts to transportation within Keesler AFB would be minimal. The small size of the project would not produce a volume of construction related traffic that would significantly impact existing conditions. Personal vehicles and small trucks of the contractor and subcontractors would be on site or at an area designated by the base. A period of approximately 10 hours is required for cement trucks to enter the base for the foundation placement of each ASR-11. The foundation concrete must be placed continuously, thus necessitating the 10-hour period for each of the two new proposed ASR-11 radar stations. This would occur at two separate times as the two new ASR-11 radar systems will not be constructed simultaneously. Heavy vehicles, including cement trucks, are frequently on base roads. Therefore, the cement trucks and other construction vehicles necessary for construction are not expected to have a substantial impact on base roads. Construction related activities are not expected to interfere with traffic conditions or proposed alterations in the training area.

4.3.2 Long-term Impacts

It is not anticipated that future utility and transportation conditions at Keesler AFB would be affected as a result of operating the two proposed ASR-11 radar systems. However, a minimal increase in electrical demand may occur while the two new ASR-11 radar systems and the

existing AN/GPN-20 and AN/GPN-22 radar systems are operating simultaneously. The addition of electrical power lines, telephone lines, and fiber optic cable at any of the alternative radar sites would not have a significant effect on the utilities in the area. The operation of the ASR-11 radar systems would not require water resources, wastewater treatment, collection of solid waste, or natural gas resources; therefore, no impacts to those utilities are anticipated. No long-term impacts to traffic are anticipated. There would be no additional road construction for any of the four alternative ASR-11 sites. The proposed 16-foot by 10-foot access drive for Site 3 is not anticipated to affect the transportation network on the base. Thus, there would be no future impacts to the existing transportation network on base.

4.4 NOISE

4.4.1 Short-term Impacts

Construction of the radar towers and supporting infrastructure, including connections to power and telephone, and installation of the fiber optic cable, would result in elevated noise levels as grading and minor excavation occur, and as construction of the tower proceeds. These elevated noise levels could disrupt classroom activities in and around adjacent training buildings. Impacts would be short-term in nature and could be mitigated to some extent. Typical construction equipment noise levels may be reduced by using well-maintained equipment and by installing mufflers and engine jackets (Table 4.4-1). Construction of the towers and supporting infrastructure is anticipated to take approximately three weeks per radar facility; therefore, any elevated noise levels would be restricted to this short-term period.

4.4.2 Long-term Impacts

No long-term noise impacts are anticipated to result from operation of the proposed ASR-11 radars. Noise levels generated by the ASR-11s would be maintained at a level consistent with current Occupational Safety and Health Administration (OSHA) regulations as specified in CFR Title 29, Part 1910. Noise from ASR-11 equipment located in operational areas would be designed not to exceed 55 decibels at any time. Noise from the ASR-11 system equipment located in general work areas is not expected to exceed 65 decibels, including periods when the cabinet doors are open. The antenna pedestal with its drives, mounted on the tower, will be

Table 4.4-1. Construction Equipment Noise Levels in dBA (L_{eq}) at 50 Feet

Equipment	Field Measurements	Well-Maintained Equipment with Mufflers and Engine Jackets	Best Technology (Specialized Mufflers and Shields)
Air Compressor	81	71	65
Back Hoe	85	80	76
Concrete Mixer	85	83	75
Concrete Pump	82	80	75
Concrete Vibrator	76	70	- -
Crane, Derrick	88	80	66
Crane, Mobile	83	80	76
Dozer	87	83	76
Generator	78	71	78
Grader	85	80	65
Jack Hammer	88	80	76
Loader	84	80	75
Paver	89	80	76
Pile Driver	101	90	76
Pneumatic Tool	85	75	80
Pump	76	71	65
Rock Drill	98	90	65
Roller	80	75	80
Saw	78	70	70
Scraper	88	83	65
Shovel	82	80	78
Truck	88	83	76
Truck Alarms	94	89	75

Source: Bolt, Beranek and Newman, 1974

designed not to produce noise levels in excess of 55 decibels outdoors on the ground at a distance of 100 feet from the tower. The contribution to noise in the surrounding areas, even with the four radars operating simultaneously, is expected to be negligible, especially considering the persistent nature of existing noise produced from the surrounding aircraft operations.

4.5 AIR QUALITY

4.5.1 Short-term Impacts

The short-term air quality impacts of constructing the ASR-11s would be similar at all of the four alternative sites. Site clearing and construction vehicle traffic would generate fugitive dust during the construction period. Due to the small areas to be disturbed during installation, air quality impacts would be minimal.

The distance required for utility trenching at all four alternative sites would be minimal. The amount of dust generated during construction is expected to vary in proportion to the length of new conduits required for the different utilities (see Section 4.3 for lengths). Wherever possible, existing conduits would be used to minimize the amount of new utility trenching required. Water would be applied to construction areas as needed to minimize airborne particulates. Consequently, no significant adverse short-term dust impacts are anticipated at any of the sites.

All construction vehicles and equipment would produce emissions that could temporarily affect air quality. However, because the number of vehicles required to perform the work and the construction duration is limited, emissions are not anticipated to cause an exceedence of NAAQS in the vicinity of the final ASR-11 radar sites.

4.5.2 Long-term Impacts

No impacts to air quality are anticipated to result from operation of the facility. Unlike other ASR-11 facilities proposed by the NAS Program, the radar systems at Keesler AFB would not have back-up emergency generators and thus there would be no associated emissions.

4.6 GEOLOGY AND SOILS

4.6.1 Short-term Impacts

The construction of the ASR-11 radar systems would have similar effects on soil at each of the alternative ASR-11 sites. Excavation for the footings of the radar tower will not exceed seven feet in depth. Excavation for the utility trenches is typically four feet deep, and may be up to 10 feet wide. The temporary construction staging area would be removed upon project completion and would not be anticipated to substantially impact geology or soils.

4.6.2 Long-term Impacts

No long-term impacts to the existing soils or geology would result if the ASR-11 radar systems were constructed at any of the four alternative sites.

4.7 SURFACE WATER AND GROUNDWATER

4.7.1 Short-term Impacts

It is not anticipated that installation of an ASR-11 radar system would have adverse impacts on surface water because no surface water features exist in the vicinity of any of the four alternative sites. Groundwater levels throughout the base range between four to five feet below the ground surface. Construction of the radar tower footings at any of the four alternative sites would likely intersect the groundwater table. Therefore, measures would have to be taken during construction activities to handle and discharge groundwater appropriately. There is a concern, however, regarding potential subsurface contamination in the areas of **Site 3** and **Site 4**. In the event that any contaminated soils are encountered, proper base procedures would be followed (see Section 4.11). All four alternative sites have good to fair drainage capability, therefore stormwater runoff is not expected to be a problem. However, during construction, all activities will follow the base best management practices (BMP) guidelines to prevent sedimentation and erosion during storm events.

4.7.2 Long-term Impacts

No long-term impacts to the surface water or groundwater are anticipated to result from the operation of an ASR-11 radar system at any of the four alternative sites. Final design of the ASR-11 systems will accommodate any surface water flow. Much of the area where the four alternative sites are located is highly developed, and covered with impermeable surfaces (e.g. concrete or asphalt). It is unlikely that the new ASR-11 systems would substantially change the current patterns of stormwater runoff.

4.8 BIOLOGICAL RESOURCES

The following paragraphs describe potential short- and long-term effects of the installation of the ASR-11 systems on biological resources. The biological resources addressed in this section consist of vegetation, wetlands, wildlife, and threatened and endangered species.

4.8.1 Short-term Impacts

The short-term impacts of installing an ASR-11 would be relatively similar at any of the four alternative sites because all of the sites possess similar biological characteristics.

4.8.1.1 Vegetation. The construction of the ASR-11 would require the clearing of vegetation in the immediate areas of the facility, along its access route (for **Site 3** only), and within the temporary construction staging area. **Site 2**, **Site 4**, and **Site 7** would not require construction of an access road to the new ASR-11 facility due to the existing concrete in the proposed project areas. The access road for Site 3 would be 10 feet by 16 feet, or 160 square feet. The proposed facility area for all four alternative sites will be 47 feet by 61 feet. It should be mentioned that the temporary construction staging area would be selected based primarily on the site's existing suitability for staging activities; therefore, clearing of vegetation is expected to be unnecessary or minimal. The clearing of vegetation in the area of Site 2 would not be required because this site is completely devoid of vegetation. The vegetation at Site 3 and Site 4 consists only of mowed grass, therefore disturbance of vegetation at these sites is anticipated to be minimal. Five small trees (around 15 feet in height and less than 6 inches in diameter at breast height) exist in the general area of Site 3; however, it is not anticipated that these trees would be disturbed. The

trees fall below the size criterion of protected trees in Biloxi; therefore, if it becomes necessary to remove one or more of these trees, the removals would not require permitting through the City. The Base Commander must approve any tree removals, regardless of size, and all trimming, if necessary, would be completed by an arborist. A small strip of grass on the eastern portion of Site 7 would be removed during construction of the radar.

4.8.1.2 Wetlands. There are no wetland areas in the vicinity of the alternative site locations; therefore, no impacts to wetlands are anticipated to result from the construction of the ASR-11 facilities.

4.8.1.3 Wildlife. Due to the relatively limited area proposed for disturbance and the minimal wildlife found in the immediate areas, construction of the ASR-11 facilities is not anticipated to substantially impact wildlife in the area. Wildlife populations found in the areas of all four alternative sites are likely to be accustomed to periodic noise intrusions, because of the persistent nature of the airfield operations.

4.8.1.4 Threatened and Endangered Species. No threatened or endangered species are expected to be encountered at the alternative ASR-11 sites; therefore, no impacts to threatened or endangered species are anticipated to result from construction of the facilities in these areas.

4.8.2 Long-term Impacts

Operation of the ASR-11 at any of the four alternative sites has limited potential to result in long-term impacts on biological resources, as noted below.

4.8.2.1 Vegetation. Installation of an ASR-11 at **Site 2** would not be expected to result in any long-term impacts to vegetation due to the absence of vegetation at this location. Installation of an ASR-11 at **Site 3, Site 4,** and **Site 7** would result in the permanent clearing of mowed grass in the immediate area of the facility. Additionally, Site 3 would require the permanent clearing of grass along the 160 square foot access road. Due to the minimal areas required for clearing at these sites and the minimal vegetation found in these areas, removal of vegetation from these areas is not expected to present a substantial impact.

4.8.2.2 Wetlands. Due to the absence of wetlands from the proposed ASR-11 sites, no long-term impacts to wetlands are anticipated.

4.8.2.3 Wildlife. The four ASR-11 sites are located in areas characterized by minimal wildlife use. Consequently, the presence and operation of the DASR system is not anticipated to interfere with wildlife. The ASR-11 towers could theoretically pose an obstacle to birds flying through the area of the site. However, as discussed in the Programmatic EA for the NAS program (USAF, 1995a), the relatively low height of the ASR-11 antenna is not anticipated to pose a substantial threat to birds flying through the area.

4.8.2.4 Threatened and Endangered Species. No threatened or endangered species are expected to be encountered at any of the alternative ASR-11 site locations; therefore, no impacts are anticipated to result from radar operation.

4.9 AESTHETICS

4.9.1 Short-term Impacts

The construction of the ASR-11s at any of the four alternative sites would not adversely impact the aesthetic resources at Keesler AFB. The aesthetic value of these areas is linked to the military function of the base; views of ASR-11 construction activity and existing radar removal would not significantly alter the aesthetic resources at the sites.

4.9.2 Long-term Impacts

The long-term presence and operation of an ASR-11 at all four alternative sites would be consistent with the aesthetic character of the military structures and facilities in the vicinity of the training area.

Operation of the ASR-11 facility would involve the introduction of lighting into the area of the selected alternative locations. Lighting fixtures to be installed at the ASR-11 facility would generally consist of the following: two red, steady burning, 116-watt obstruction lights on top of the antenna; 200-watt area lights on each stair landing of the tower to provide illumination for

authorized personnel; two 1,000-watt outdoor area lights to be projected downward to illuminate the area within the fenced footprint; and fluorescent indoor area lighting installed in the equipment shelter on the site. The tower stairway lights and outdoor area lighting will be illuminated only when needed for nighttime maintenance activities. Impacts associated with lighting at all alternative sites are expected to be minimal due to their location within the functional areas of the base.

4.10 CULTURAL RESOURCES

4.10.1 Short-term Impacts

Based on cultural resource surveys for Keesler AFB, cultural resources are not likely to be present within the proposed project areas for the four alternative sites. Construction activities associated with installing the ASR-11s are not anticipated to impact any cultural resources. In addition, trenching that will be required for utilities servicing any of the four potential ASR-11 sites is not anticipated to impact cultural resources.

4.10.2 Long-term Impacts

No long-term impacts to cultural resources are anticipated to result from the operation of the ASR-11s at any of the four alternative sites.

4.11 POLLUTION PREVENTION AND HAZARDOUS WASTE

4.11.1 Short-term Impacts

The potential short-term pollution and hazardous waste impacts resulting from construction of the two ASR-11s are discussed in the following sections.

4.11.1.1 Pollution Prevention. The construction phase of the ASR-11 radar system would comply with applicable Keesler AFB policies and guidelines for pollution prevention. In addition, a pollution prevention plan has been developed for the NAS program. This plan prohibits the use of all Class I ozone depleting chemicals and directs the contractor to minimize

the use of Class II ozone depleting chemicals, and toxic substances. Consequently, hazardous waste generation is anticipated to be reduced to the maximum extent possible during construction of the two new radar facilities. Similar pollution prevention measures would be implemented during ASR-11 construction regardless of the alternative sites at which the two new facilities would be constructed.

4.11.1.2 Hazardous Waste. At each of the four alternative ASR-11 sites, some hazardous materials and waste would likely be used and generated during the ASR-11 construction, including: equipment fuel, engine oil, hydraulic oil, grease, and other equipment operation and maintenance material. Refueling of equipment may also take place at the alternative ASR-11 construction sites. All hazardous materials would be used, stored, transported, and disposed in accordance with base, military, state, and federal regulations.

Of the four alternative ASR-11 sites, **Site 7** is located closest to an existing IRP site (ST-07). Even though groundwater is within four to five feet of the surface and sometimes found less than 3 feet below the surface (USAF, 1996a), no contaminated soils or plumes due to ST-07 have been observed within the vicinity of Site 7. A closed IRP site (ST-16) consisting of an abandoned fuel line is located just north of **Sites 3** and **4**. This IRP site has been closed out by the EPA and MDEQ as no further action required; however, there is a possibility of encountering fuels or fuel vapors at these locations (USAF, 2000i). No contaminated soils are expected to be encountered at **Site 2**. In the event that any contaminated soils are encountered, proper base procedures would be followed.

4.11.2 Long-term Impacts

The potential long-term pollution and hazardous waste impacts resulting from construction of the two ASR-11s are discussed in the following sections.

4.11.2.1 Pollution Prevention. As indicated above, a pollution prevention plan has been developed for the NAS program, which prohibits the use of all Class I ozone depleting chemicals, and directs the contractor to minimize the use of Class II ozone depleting chemicals and toxic substances. In addition, operation of the ASR-11 radar system would comply with all

applicable Keesler AFB policies and guidelines for pollution prevention. Consequently, hazardous waste generation is anticipated to be reduced to the maximum extent possible during the operation of the ASR-11 facilities.

4.11.2.2 Hazardous Waste. Due to the fact that Keesler AFB is used primarily as a training facility, there will be no need for an emergency backup generator or diesel fuel storage tank. When a power outage occurs on the base, classes are canceled; therefore, there is no need to use the ASR-11 radar systems or the existing training radar systems during a power outage.

Hazardous materials and waste generation during operation of the proposed ASR-11 facilities would be minimal. All hazardous waste would be used and disposed of in accordance with applicable regulations and base policies. Consequently, it is not anticipated that any soil or groundwater contamination would occur as a result of operating the radar.

4.12 ELECTROMAGNETIC ENERGY

4.12.1 Short-term Impacts

Construction at any of the ASR-11 alternative sites on Keesler AFB is not expected to generate RFR at levels that would be harmful to human health. Some low levels of RFR could be generated from commonly used devices at construction sites, such as cellular telephones or portable computers. However, any RFR generated, and any other electric or magnetic fields, would be typical of that which exists throughout the human environment and is not anticipated to be harmful to human health. The existing AN/GPN-20s will not be operated during construction of the ASR-11 radars to minimize the potential for RFR hazards to workers. The AN/GPN-22s will remain in operation during construction of the ASR-11 radars; however, these radars are not anticipated to present a hazard because of their stationary position directly overhead.

4.12.2 Long-term Impacts

Operation of the ASR-11 radars at any of the four alternative sites would generate identical levels of electric and magnetic fields, including RFR. As discussed in Section 3.12, the RFR generated by the existing AN/GPN-20s is only hazardous at close distances to the radar when it

is operating. Similarly, the RFR generated by each ASR-11 would only be hazardous at close ranges, while the radar is operating (see below). The tower immediately below the radar would be in the spillover region, and would be hazardous to humans while the radar is operating. At any of the four alternative sites, the facility would be sited in a location that it would not pose a RFR hazard to personnel within the general vicinity of any of the ASR-11 sites. Signs would be posted at the perimeter of the ASR-11 facility warning against approaching the antenna while it is in operation to advise personnel in the area of the RFR hazard at close ranges. There would be no RFR generated from the antenna, and therefore no RFR hazard, when the antenna is not in operation. If necessary, blanking of certain azimuths will occur to avoid directing the ASR-11 beam at occupied buildings. This blanking may also be used to avoid interference with the existing AN/GPN-20s, which will remain active for a period of approximately ten years following installation of the ASR-11s. Additional precautionary measures to avoid interference between the ASR-11s and the AN/GPN-20s, in addition to blanking, include installation of filters and installation of dispersive medium. The goals of these measures are to prevent interference through filtering; inhibit ASR-11 PSR transmitter radiation when the ASR-11 detects signal level 25dB below the peak of the AN/GPN-20 main beam level; inhibit the ASR-11 PSR transmitter when the AN/GPN-20 main beam sweeps the ASR-11 side-lobe transmissions; and reduce reflections by installation of mesh fence. Successful blanking is currently used to avoid interactions between the two existing AN/GPN-20 systems that are located within the same vicinity. A final measure of precaution to be taken by the base is the scheduling of classes appropriately to reduce the number of ASRs operational at any one time.

The following comparison to various RFR safety standards is adapted from the October 1997 *Radiofrequency Impact Analysis for Airport Surveillance Radar-11* (SRI, 1997), prepared for the FAA.

Terms such as “safety standards” and “exposure standards” generally refer to, and are frequently used interchangeably with, specifications or guidelines on maximum public or occupational exposure levels to electromagnetic fields. Such levels are usually expressed as maximum power densities or field intensities in specific frequency ranges for stated exposure durations. Exposure guidelines have been developed by private organizations such as the American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE), and the

National Council on Radiological Protection (NCRP, now called the National Council on Radiation Protection and Measurements) as voluntary guidelines for occupational or general public exposure, or both. Governmental agencies such as the Federal Communications Commission (FCC) and various state and municipal bodies have adopted such guidelines or variations thereof as enforceable stands. The draft version of FAA Order 3910.3B, Radiation Safety Program (1997), adopts the ANSI/IEEE exposure guidelines.

The ANSI/IEEE (1992) guidelines cover the frequency range from 0.003 MHz to 300,000 MHz, and separately specify the maximum permissible exposure (MPE) in "uncontrolled environments" (accessible by the general population) and "controlled environments" (such as occupational exposure). In the ASR-11 frequency band of 2,700-2,900 MHz, the MPE for uncontrolled environments is 1.80-1.93 milliwatts per square centimeter (mW/cm^2) averaged over a 30-minute period. The guideline level for controlled environments is 9-10 mW/cm^2 averaged over a 6-minute period.

In 1988, the International Radiation Protection Association (IRPA) published guidelines (1988) for occupational and public exposure to RFR in the frequency range 0.001 MHz to 300,000 MHz. At the ASR-11 frequency, the MPE for occupational exposure is 5 mW/cm^2 averaged over a 6-minute period. The MPE for non-occupational exposure is 1 mW/cm^2 averaged over a 6-minute period. The MPE for pulsed RFR is set at 1,000 times that MPE for time-averaged exposure. Thus, at ASR-11 frequency, the MPE for pulsed RFR is 1,000 mW/cm^2 peak pulse power density - the maximum power level of a single pulse. The NCRP also published guidelines for human exposure. For RFR at ASR-11 frequency, the MPE for occupational exposure is 5 mW/cm^2, averaged over 6 minutes. The corresponding MPE for exposure of the general population is 1 mW/cm^2, averaged over 30 minutes.

In August 1996, the FCC adopted a hybrid standard based in part on the ANSI/IEEE (1992) guidelines and in part on the NCRP guidelines. For occupational exposure to RFR in the ASR-11 frequency band, the FCC MPE is the same as the NCRP guideline level.

The power density of the ASR-11 beam varies considerably between the near-field (within 260 feet of the antenna) and the far-field (greater than 260 feet away) (FAA, 1997). Thus, far-field conditions apply to almost all the receptors near the proposed radar sites and are presented herein. Any differences in power densities would be conservative, because near-field calculations lead to lower predicted power densities than do far-field calculations. The power density of the ASR-11 signal can be represented by peak pulse power or as the power averaged over a time period, usually several or more minutes. At a distance of 23 meters (75 feet) from the ASR-11 antenna, the peak power density of the ASR-11 signal will be 945 mW/cm^2, less than the 1,000 mW/cm^2 MPE for peak power density established by the IRPA, as discussed above. The peak power density will decrease rapidly with distance from the antenna. At all locations more than 23 meters (75 feet) from the ASR-11 antenna, the ASR-11 signal will comply with the MPE for peak power density established by the IRPA.

The average (mean) power radiated by the ASR-11 is 2.1 kilowatts (kW). At any point near the ASR-11 in normal operation (i.e. antenna is rotating), the average power density is lower than the peak density by the factor 0.00034. For the ASR-11 frequency range (uncontrolled environments), the ANSI/IEEE MPE is 1.8 to 1.93 mW/cm^2, averaged over 30 minutes. The average power density of the ASR-11 signal decreases with distance from the antenna and will fall below 1.9 mW/cm^2 at a distance of 10 meters (33 feet) from the radar antenna. Since both ASR-11s will be mounted on a tower greater than 10 meters in height, persons at ground level would not be exposed to RFR levels exceeding the ANSI/IEEE MPE. At distances of more the 13 meters (43 feet) from the ASR-11 antenna, the ASR-11 signal will comply with the MPE levels for the general population, 1.0 mW/cm^2, set forth in IRPA, NCRP, and FCC guidelines, discussed above. Thus, no impacts to nearby receptors are anticipated at any of the four alternative sites. At all locations near the radars, the ASR-11 signal will comply by an even wider margin with the guideline levels for occupational exposure set forth by ANSI/IEEE, IRPA, NCRP, and FCC. As a precautionary measure, signs would be posted at the perimeter of the DASR facility advising personnel and the public against approaching the radar facility during operation.

On infrequent occasions, the ASR-11 antennae will remain stationary for maintenance and testing purposes. The ASR-11 has interlocking capabilities and will automatically shut down during these periods; therefore, it is not anticipated that these operations will result in adverse environmental conditions.

Keesler AFB personnel raised specific safety concerns regarding ASR-11 operation at the preferred sites. Their concerns were whether the proposed ASR-11 radar transmissions would have any impact on nearby stored fuel or electro-explosive devices (EEDs), or have the potential to cause sparks when striking a nearby metal object. They also expressed concern for impacts to aircraft navigation equipment in the local area. Calculations were made to determine potential site specific impacts. For the ASR-11, other than the area immediately surrounding the antenna, there is little concern for sparking, since the cosecant-squared beamshape significantly reduces the field strengths below the mainbeam. Therefore, for ground locations in the vicinity of the radar, the storage and use of EEDs would be considered safe, unless the area was otherwise restricted for personnel hazards. With regard to the potential effects on collocated equipment (including aircraft navigation systems), the ASR-11 will operate within the approved frequency spectrum, within which there would be no other systems utilizing this portion of the spectrum. Aircraft navigation equipment should not be susceptible to routine ASR emissions, given the long-standing ubiquitous nature of these emissions from similar systems at airfields across the country and across the world without incident (USAF, 2000k).

5.0 COMPARISON OF ENVIRONMENTAL CONSEQUENCES AND SELECTION OF ENVIRONMENTALLY PREFERRED ALTERNATIVE

The four alternative sites have similar existing conditions. All four sites occur within the training facility of the base and are characterized by similar socioeconomic, air quality, geologic, hydrologic, archaeological and cultural resource conditions, and noise levels. Sites 3 and 4 are characterized by a mowed grassy area with no other vegetation present; Sites 2 and 7 are characterized by a concrete walk and taxi area. No surface water resources or wetlands and no known threatened or endangered species are present at any of the sites. No significant differences in electromagnetic effects are expected at any of the sites.

No adverse short-term socioeconomic, geologic, hydrologic, archaeological and cultural resources impacts are expected at any of the four sites. Also, no construction activities for any of the four alternative sites will occur within or near existing IRP sites. Construction at **Site 7** may require relocation of a sewer line, causing a short-term utility impact. Construction activities at the four alternative sites may encounter groundwater. A depth of 7 to 8 feet would be required to install footings for the ASR-11 tower, and groundwater has been reported within 3 feet of the ground surface of the base. No contaminated groundwater is expected to be encountered during the construction of the ASR-11 towers at any of the four alternative sites, although there is a slight possibility that fuel or fuel vapor would be encountered at **Site 3** and **Site 4**. Short-term impacts may occur to land use, air quality, and noise at each of the four alternative sites. The four alternative sites are at various distances from existing electric, telephone, and data communication lines, but none is greater than 650 feet. The longer length of trench required for conduits would lead to potentially increased dust and noise levels for a small portion of the construction period.

No long-term socioeconomic, utilities, noise, air quality, geologic, hydrologic, and archaeological and cultural resources impacts are anticipated at any of the four sites. All four alternative sites have similar aesthetic characteristics due to their proximity to training activities on the base and would be consistent with the military aesthetic value of the base.

Although the radar would generate RFR while operating, persons at ground level would not be exposed to RFR levels exceeding the maximum permissible exposure (MPE) levels for the general population, since the ASR-11 will be mounted on a tower greater than 57 feet in height. Due to the nature of the activity on the base (training only), the radar will not be used regularly between midnight and six in the morning, and portions of the coverage will be blocked when the radar is in use. As a precautionary measure, signs would be posted at the perimeter of the DASR facility advising personnel and the public against approaching the radar facility during operation. When a power outage occurs on base all training activities are discontinued; therefore, no fuel and other hazardous materials would be used at the site, such as engine oil and grease, for a back up generator. Consequently, it is anticipated that operational use of hazardous materials would be very minor, limited to lubricating oils and greases required for the proposed DASR facility.

In summary, construction and operation of the two ASR-11 facilities would result in minimal short-term and long-term impacts at any of the four alternative sites. Only one radar facility would be constructed at each of the two preferred sites. All sites would be acceptable locations for the ASR-11 facility from an environmental perspective. Due to operational and other base considerations, the Air Force has selected **Site 3** and **Site 4** as the preferred ASR-11 locations.

6.0 MITIGATION

Most of the impacts that may occur at any of the sites during construction and operation of the DASR system are minor in nature and few mitigation measures would be required. To minimize noise impacts during construction, mufflers would be used on construction equipment and vehicles. In addition, all equipment and vehicles used during construction would be maintained in good operating condition so that emissions are minimized, thus reducing the potential for air quality impacts. Dust will be controlled on-site by using water to wet down disturbed areas. The small area that will be permanently cleared for the DASR facilities would be stabilized using either geotextile fabric with gravel or pavement, to minimize the potential for erosion. In addition, all other areas disturbed outside of the ASR-11 facility area, including the temporary staging area, would be seeded or re-paved, whichever applicable, upon project completion. All hazardous materials used during construction would be handled and disposed of in accordance with Keesler AFB policies and protocols and all applicable state and federal regulations. Traffic management measures would be developed to facilitate traffic flow and pedestrian access. Site 3 may require the replanting of trees, if it is determined that any of the nearby trees must be removed. Additionally, due to the potential for RFR hazards at close distance during operation of the ASR-11s, warning signs indicating the safe distance from the operating radar would be installed at the facility perimeter.

7.0 ACRONYMS AND ABBREVIATIONS

A/C	Alternating current
AFB	Air Force Base
AFI	Air Force Instruction
AM	Amplitude modulation (radio)
AN/GPN-20	(airport surveillance radar model designation)
ANSI	American National Standards Institute
ASR-11	(airport surveillance radar model designation)
AST	above-ground storage tank
ATCT	air traffic control tower
CFR	Code of Federal Regulations
DASR	Digital Airport Surveillance Radar
dBA	decibel, A-weighted
DoD	(U.S.) Department of Defense
DRMO	Defense Reutilization and Marketing Office
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
°F	degrees Fahrenheit (temperature)
FAA	Federal Aviation Administration (Dept of Transportation)
FAR	Federal Aviation Regulation
FCC	Federal Communications Commission
FM	Frequency modulation (radio)
FONSI	Finding of no significant impact
FY	Fiscal Year
Hz	hertz
IEEE	Institute of Electrical Electronics Engineers
IRP	Installation Restoration Program
IRPA	International Radiation Protection Association

ACRONYMS AND ABBREVIATIONS (continued)

kGal	kilogallon
kHz	kilohertz
kVA	kilovolt-amperes
kW	kilowatts
L_{eq}	equivalent sound level
LOS	line of sight
m	meters
MCL	Maximum Concentration Level
m/sec	meters per second
mg/m^3	milligrams per cubic meter
MHz	megahertz
MMBtu	Million British Thermal Unit
MPE	Maximum Permissible Exposure
MSSR	Monopulse Secondary Surveillance Radar
MW	megawatts
mW/cm^2	milliwatts per square centimeter
$\mu g/m^3$	micrograms per cubic meter
µm	micrometers (microns)
NAAQS	National Ambient Air Quality Standards
NAS	National Airspace System
NCRP	National Council on Radiological Protection
NDI	Non Destructive Inspection
NEPA	National Environmental Policy Act
nm	nanometers
nmi	nautical mile
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PM-2.5	Particulate matter below 2.5 microns
PM-10	Particulate matter below 10 microns
ppm	parts per million (by volume in air)
PSR	Primary Surveillance Radar

ACRONYMS AND ABBREVIATIONS (continued)

RAPCON	Radar Approach Control
RCRA	Resource Conservation and Recovery Act
RFR	Radiofrequency radiation
ROW	right-of-way
USAF	United States (Department of the) Air Force
UST	Underground storage tank
VOC	Volitile Organic Compound

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APPENDIX A: LISTING OF AGENCIES AND INDIVIDUALS CONTACTED

LISTING OF AGENCIES AND INDIVIDUALS CONTACTED

Keesler AFB, Civil Engineering (81 CES/CEV), Hazardous Waste Manager, George Daniel

Keesler AFB, Civil Engineering (81 CES/CEOE), Engineering Tech., Russel Duckworth

Keesler AFB, Civil Engineering (81 CES/CEOE), Robert Moseley

Keesler AFB, Civil Engineering (81 CES/CEV), Lisa Noble

Keesler AFB, Civil Engineering (81 CES/CEOI), William Pfeifer

Keesler AFB, (81 TRSS/TSDE), MSgt. Karen MacNaughton

Keesler AFB, Training Manager, Deborah Sterling

Keesler AFB, Communications Squadron, MSgt. Trepagnier

Mississippi Department of Environmental Quality, Office of Pollution Control,
Air Division, Connie Simmons

University of Mississippi Center of Population Studies, Clifford Holley

APPENDIX B: GENERAL SCREENING LEVELS AND CRITERIA FROM NAS DIGITAL AIRPORT SURVEILLANCE RADAR SITING PLAN

GENERAL SCREENING LEVELS AND CRITERIA FROM NAS DIGITAL AIRPORT SURVEILLANCE RADAR SITING PLAN

EXCLUSIONARY	RESTRICTIVE	SELECTIVE
E1 Occupied Existing Structures	R1 Ecological/Wildlife Refuges, Preserves, Conservation Areas, and Sanctuaries	S1 Visual Sensitivity
E2 Railroads	R2 Wild and Scenic Rivers	S2 Accessibility to Roads
E3 Highways	R3 Prime and Unique Farmlands	S3 Soils
E4 Runways and Taxiways	R4 National, State, and Municipal Parks and Recreation Areas	S4 Geology
E5 Power Lines	R5 Historical, Archeological, and Cultural Sensitive Areas	S5 Proximity to Power
E6 Wilderness Areas	R6 Wetlands	S6 Proximity to Telephone Lines
E9 National Natural Landmarks	R7 Endangered and Threatened Species Habitat	S7 Zoning
E10 Sites Less than ½ Acre	R8 Non-Airfield or Non-Federal Land	S8 Subsurface Rights
Additional Operational Criteria to be Provided by DASR Systems Coordinator	R9 Designated Hazardous Waste Site	S9 Unique Habitat
	R10 Capped Land Fill	S10 Utilities
	R11 Scenic Highways	S11 Planned Use of Site
	R12 Coastal Zones	S12 Roadways
	R13 Slope	S13 Water Resources
	R14 Floodplain	S14 Recreational Use
		S15 Bodies of Water

Source: U.S. Air Force, 1995c

APPENDIX C: PRELIMINARY SITE SCREENING CRITERIA FOR KEESLER AFB

PRELIMINARY SITE SCREENING CRITERIA FOR KEESLER AFB

EXCLUSIONARY CRITERIA

These criteria consider the essential environmental, constructional, and operational constraints that could eliminate a site from further consideration as a potential site for the ASR-11 System. These criteria relate to environmental parameters that could lead to unmitigable significant impacts and physical parameters regarding a site's suitability for construction.

Criteria	**Site 1**	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**	**Site 7**
Impacts occupied existing structures	No	No	No	No	No	No	No
Within railroad ROW	No	No	No	No	No	No	No
Within highway ROW	No	No	No	No	No	No	No
Within runways and/or taxiways	No	No	No	No	No	No	No
Within power line ROW	No	No	No	No	No	No	No
Impacts wilderness areas	No	No	No	No	No	No	No
Impacts national natural landmarks	No	No	No	No	No	No	No
Site less than 160 by 160 feet	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]
Lacks coverage of aircraft targets within 1 nmi of the takeoff runway ends	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Within 1,500 feet of any above ground screening object	Yes[3]	Yes[3]	Yes[3]	Yes[3]	Yes[3]	Yes[3]	Yes[3]
Cone of silence location impacts visibility of air routes or navigational fixes	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Airport specific exclusions	No	No	No	No	No	No	No
Violates FAR Part 77 requirements	No	No	No	No	No	No	No

No = Meets Criteria
Yes = Does Not Meet Criteria

1 Standard size waived by 338th Training Squadron due to available land limitations.
2 The ASR-11 Systems will not be required to provide radar coverage to any specific air routes, navigational fixes, runway approaches, or runway surfaces.
3 Water tower to the north and emissions stack situated at Dolan Hall.

Source: U.S. Air Force, 2000a

RESTRICTIVE SCREENING CRITERIA

These criteria could eliminate a site from further consideration due to the extensive mitigation required to offset potentially significant impacts. Many of these criteria originate from Federal law. In these cases, the law has been noted. Additionally, many of the criteria are covered by state and local laws, which were consulted as appropriate.

Criteria	**Site 1**	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**	**Site 7**
Ecological or wildlife refuges	5	5	5	5	5	5	5
Wild and scenic rivers	5	5	5	5	5	5	5
Prime farmland	5	5	5	5	5	5	5
National, state, and municipal parks and recreation areas	5	5	5	5	5	5	5
Historical, archeological, and cultural sensitive sites	5	5	5	5	5	5	5
Wetlands	5	5	5	5	5	5	5
Endangered and threatened species habitat	5	5	5	5	5	5	5
Non-airfield or non-federal land	5	5	5	5	5	5	5
Hazardous waste site	5	5	3[1]	3[1]	5	5	5
Capped landfill	5	5	5	5	5	5	5
Scenic highways	5	5	5	5	5	5	5
Coastal zones	5	5	5	5	5	5	5
Steep terrain	5	5	5	5	5	5	5
Floodplain	5	5	5	5	5	5	5
Within 2,500 feet of existing electronic facilities or power lines that could interfere with operation	3[2]	3[2]	3[2]	3[2]	3[2]	3[2]	3[2]
Primary radar coverage to the threshold of runways	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
Secondary radar coverage, on the surface, over the entire length of runways	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]
Within 2,500 feet of industrial operations that could interrupt or contaminate the site	5	5	5	5	5	5	5
Within 0.5 nmi of edges of any operational runways and approach and departure paths	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]

5 = No Adverse Impacts/Meets Criteria
3 = Partially Impacted/Marginal
1 = Significantly Impacted/Does Not Meet Criteria

[1] Site located in proximity of abandoned underground fuel line.
[2] Power lines traverse the immediate area and electronic maintenance facilities are also located nearby.
[3] The ASR-11 systems will not be required to provide radar coverage to any specific air routes, navigational fixes, runway approaches, or runway surfaces.

Source: U.S. Air Force, 2000a

SELECTIVE SCREENING CRITERIA

These criteria provide positive or negative considerations that will form the basis for comparison of candidate sites. Much of the information required will be obtained during site visits.

Criteria	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Visual sensitivity	-[1]	+	+	+	o Adjacent to training classrooms	o Adjacent to existing towers	-[1]
Accessibility to roads	+	+	+	+	+	+	+
Soils	+	+	+	+	+	+	+
Geology	+	+	+	+	+	+	+
Proximity to power	+	+	+	+	+	+	+
Proximity to telephone lines	+	+	+	+	+	+	+
Zoning	+	+	+	+	+	+	+
Subsurface rights	+	+	+	+	+	+	+
Unique habitat	+	+	+	+	+	+	+
Utilities	+	+	+	+	+	+	+
Planned use of site	o	o	o	o	o	o	+
Roadways	+	+	+	+	+	+	+
Water resources	+	+	+	+	+	+	+
Recreational use	+	+	+	+	+	+	+
Bodies of water	+	+	+	+	+	+	+
Underground cable routing	+	+	+	+	+	+	+
LOS visibility to air traffic coverage requirements	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]

+ = Positive
– = Negative
o = Neutral

[1] Site is located near road well traveled by base population.
[2] Air traffic coverage requirements were not a part of the site survey process for this facility.

Source: U.S. Air Force, 2000a